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TECHNICAL REPORT ARBRL-TR-02238

ROLE OF THE INSULATING LAYER FROM TiO₂-WAX LINER IN REDUCING GUN TUBE WEAR

J. Richard Ward Timothy L. Brosseau



April 1980



US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND BALLISTIC RESEARCH LABORATORY ABERDEEN PROVING GROUND, MARYLAND

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Adoption of wear-reducing liners into the 105 mm M392 APDS projectile increased the wear life of the M68 cannon from 100 to 400 rounds for polyure-thane foam and 10,000 rounds for ${\rm TiO}_9$ -wax.

Heat transfer measurements on the M68 tank cannon concluded the additives reduced heat input and the efficiency of the ${\rm TiO}_2$ -wax rested with the presence

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20. ABSTRACT: (Cont'd)

of flaps and an insulating deposit formed with successive firings of TiO2-wax rounds. To test the hypothesis the insulating residue contributes to erosion-protection and to establish credibility of the heat transfer to design additives, a 1200-round firing test was conducted in which 600 APDS and 600 HEP rounds were fired alternately. Based on wear per round established for APDS and HEP rounds, one would have expected 0.19 mm of wear for the 1200 rounds. Instead, the 1200-round test produced 1.9 mm of wear establishing the importance of the insulating residue.

It was also observed the secondary wear increased for the alternate APDS-HEP round test. This confirms an earlier hypothesis that the secondary wear arises because the additive is not effective down bore.

The total wear of 1.9 mm was twice as much as predicted from a correlation between heat input and wear. It is postulated that the APDS round is more erosive when it is preceded by a low-velocity HEP round than by another APDS round. The extra erosivity of the APDS round is attributed to a thicker oxide layer left on the barrel by the HEP round.

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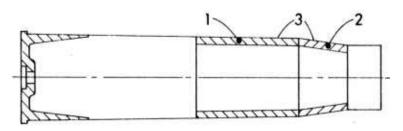
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I. INTRODUCTION

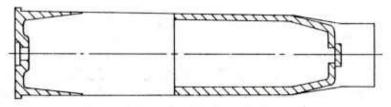
The only advance in barrel wear reduction since the Second World War work on erosion has been the wear-reducing liner. The original wear-reducing liner was invented in Canada and is composed of a high-density polyurethane foam glued to the wall of a cartridge case. Soon after the US adopted the polyurethane foam in high-velocity tank guns, Swedish inventors devised a liner made from a 45/55 percent by weight blend of ${\rm Ti0}_2$ and paraffin wax 3. The Swedish also modified the configuration of the liner by cutting flaps that were folded over the propellant at the projectile base. Figure 1 depicts each liner in the 105 mm M115B1 cartridge case to illustrate how the liners are loaded and to show the flaps the Swedish inventors devised.

STANDARD POLYURETHANE LINER



- 1. LARGE POLYURETHANE (.087 kg)
- 2. SMALL POLYURETHANE (.027 kg)
- 3. GLUED

STANDARD TIO2/WAX LINER



1. TiO2/WAX WITH FLAPS (.141 kg)

Figure 1. Configuration of Wear-Reducing Additives

¹"Hypervelocity Guns and the Control of Gun Erosion", Summary Technical Report of Division 1, NDRC, Volume I, Washington, DC, 1946.

 $^{^2}$ L. A. Dickinson and D. E. McLennan, "Improvement of the Firing Accuracy and Cost Effectiveness of Guns Through the Use of Urethane Foams", J. Cellular Plastics, 1968, 184 (1968).

³S. Y. Ek and D. E. Jacobsen, "Engineering Study of Barrel Wear-Reducing Additives", Wegematic Corporation Report, Part A, May 1962.

The relative performance of the two additives is shown in Figures 2 and 3. Polyurethane foam increased the wear life from 100 to 400 rounds⁴; the Swedish additive yielded a wear life of 10,000 rounds⁵. In addition, the Swedish additive provided better downbore protection, especially at the region of secondary wear seen in Figure 3 with polyurethane foam.

The surprising difference between the polyurethane foam liner and the Swedish additive prompted work to discover why the Swedish additive was so effective. Two differences were evident, the flaps and the metal oxide, ${\rm Ti0}_2$, which might form an insulating residue. This speculation arose from the APG tests with Swedish additive in which a residue composed mainly of ${\rm Ti0}_2$ was removed from the M68 cannon and analyzed. Table I compares Swedish additive and the residue.

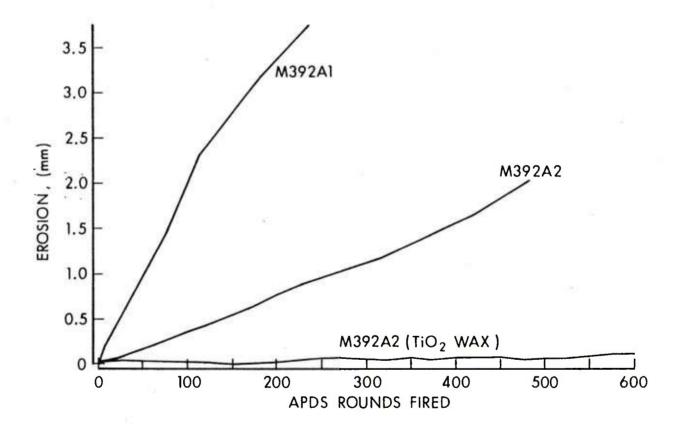


Figure 2. Erosion \underline{vs} Rounds Fired for APDS Rounds

R. Wolff, "Reduction of Gun Erosion - Part I. Laminar Coolant", Picatinny Arsenal Technical Report No. 3069, May 1963.

⁵R. O. Wolff, "Reduction of Gun Erosion Part II. Barrel Wear-Reducing Additive", Picatinny Arsenal Technical Report No. 3096, August 1963.

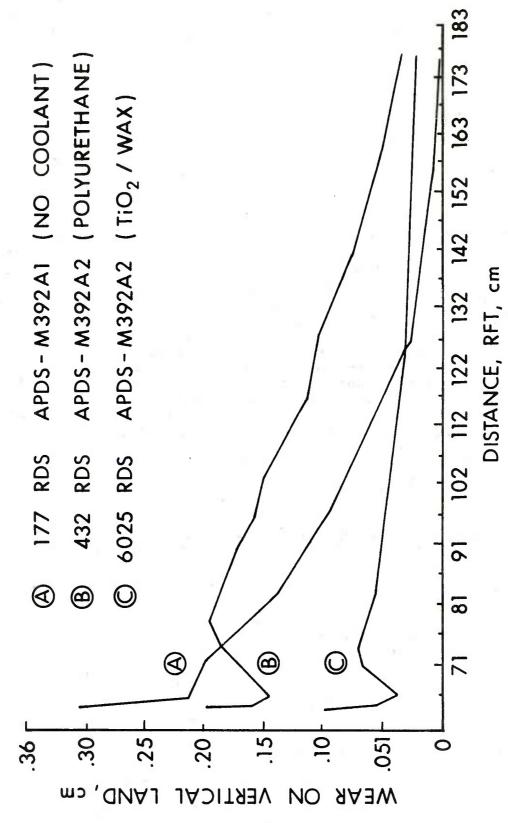


Figure 3. Wear Profile for M68 Tank Cannon Firing APDS Rounds

Table I. Composition of Swedish Additive and Bore Residue Recovered from Gun Firing Swedish Additive

Swedish Additi	ve, percent by weight	Residue, percent	by weight
TiO ₂	46.0	TiO ₂	77.4
Wax	53.5	Wax	7.1
Dacron Staple	0.5	Silica	2.6
Stearyl Alcoho	1 (1.0 maximum)	Inorganic Residue	7.7
Cloth: Viscose	Rayon	Organic Residue	5.2

Change in heat input to the barrel was the technique applied to discern factors influencing the efficiency of the additives. Brosseau and Ward noted in the 37 mm gun⁶ that the flaps enhanced the efficiency of the polyurethane foam and the TiO2-wax liner. When both liners were placed in the same configuration, heat input was equivalent. To separate any influence of bore residue, a "clean-out" round, i.e., a round with no additive, was fired after each round loaded with TiO2-wax. Calspan investigators 7 showed an insulating deposit was forming in the eightinch M201 cannon when successive shots were fired with TiO2-wax additive. Brosseau and Ward^{8,9} extended this to the 105 mm tank cannon. They showed that the flaps enhanced heat input reduction for the polyurethane foam and the TiO2-wax liner; they also fired TiO2-wax rounds successively until a minimum heat input was reached. The results are summarized in Table II. Figure 4 plots heat input vs wear which suggests the insulating residue is the principal factor contributing to the 10,000-round wear life for Swedish additive.

T. L. Brosseau and J. R. Ward, "Reduction of Heat Transfer to Gun Barrels by Wear-Reducing Additives", BRL Memorandum Report No. 2464, March 1975. (AD#B003850L)

⁷F.A. Vassallo, "Heating and Erosion Techniques Applied to the Eight-Inch Howitzer", 12th JANNAF Combustion Meeting, Volume I, CPIA Publication 273, December 1975.

⁸T. L. Brosseau and J. R. Ward, "Reduction of Heat Transfer in the 105 mm Tank Gun by Wear-Reducing Additives", BRL Memorandum Report No. 2698, November 1976. (AD#B015308L)

⁹T. L. Brosseau and J. R. Ward, "Measurement of Heat Input into the 105 mm M68 Tank Cannon Firing Rounds Equipped with Wear-Reducing Additives", BRL Technical Report 2056, April 1978. (AD#A056368)

Parallel to the conduct of the heat input experiments, Army attention focused on the cause of the secondary wear. The accuracy of the armor piercing, discarding sabot round was affected adversely by the secondary wear with the result being the condemnation limit was dropped for the M68 tank cannon from 1.9 mm to 1.4 mm wear. Ward deduced that the secondary wear was caused by the reduced efficiency of the

Table II. Correlation Between Heat Transfer and Erosion in the 105 mm Tank Gun Firing the M392 Projectile

Additive	Heat Input, J/mm*	Erosion, μm/round	Reference
None	449	18	4
Polyurethane	416	4.1	4
Ti0 ₂ -wax (flaps)- single-shot	381		
TiO ₂ -wax (flaps)	348	0.18	5
repetitive fire	_		

^{*}Heat input measurements described in reference 9.

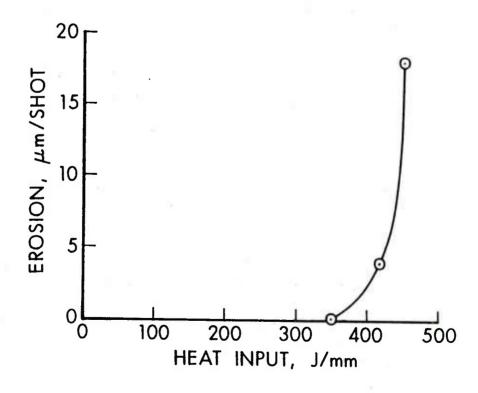


Figure 4. Heat Input \underline{vs} Erosion for APDS Rounds

additive downbore 10 . Figure 5 compares the wear per round in the M68 cannon firing rounds without additive and polyurethane foam. polyurethane foam is most effective at the commencement of rifling, but the efficiency drops downbore leading to the secondary wear peak. Figure 6 plots percent wear reduction vs distance to illustrate this point. The secondary wear is present with the TiO2-wax liner, but it is not a concern because the wear rate downbore is so slow as evidenced by Figure 3 that the 1,000 EFC rounds the M68 can fire before condemned for fatigue is reached long before the secondary wear poses a problem. Brosseau and Ward showed successive firing of TiO2-wax rounds reduced heat input downbore as well⁸. Hence, the secondary wear should be much worse in the M68 tank cannon firing $Ti0_2$ -wax rounds if the residue does not form. Since the TiO_2 -wax round with flaps is still better than polyurethane foam, the secondary wear for TiO2-wax, no insulating residue, should be less than polyurethane foam, but worse than repeated firings with TiO2-wax.

The foregoing discussion has shown that if one could measure the erosivity of $\text{Ti}0_2$ -wax without the insulating layer, one could test the hypotheses derived from heat input measurements, namely

- a. the wear predicted based on the heat transfer correlation will be 0.8 $\mu m/r$ ound and,
- b. the secondary wear will be more severe when the insulating residue doesn't form.

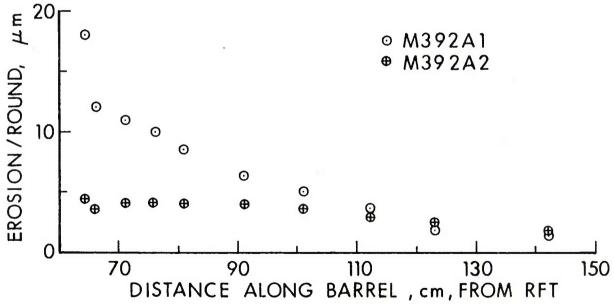


Figure 5. Wear Profile for APDS Without Additive and With Polyurethane Foam

¹⁰J. R. Ward, "Proposed Mechanism for Secondary Wear in the M68 Tank Cannon", BRL Memorandum Report No. 2557, November 1975. (AD#B008040L)

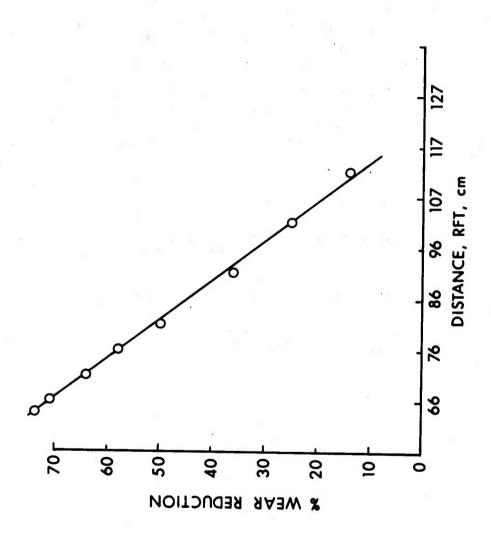


Figure 6. Percent Reduction in Wear Rate vs Distance from RFT

To measure the erosion without the residue, one need only continue repeating the sequence ${\rm Ti}\,0_2$ -wax APDS round followed by a HEP round until measurable wear takes place. This report summarizes the results of such a test.

II. EXPERIMENTAL

The test was done with standard 105 mm M392A2 projectiles and M467 target-practice projectiles as the clean-out rounds. The firings were performed under the auspices of Clyde Musick of the Materiel Testing Directorate (MTD), Aberdeen Proving Ground. The MTD report¹¹ covers ammunition lots used, firing schedule, and muzzle velocity and chamber pressure taken at the start of the test for each round.

The M68 cannon had fired previously twenty rounds during sabot-development testing. An in-bore malfunction damaged lands downbore during the sabot tests; the damaged region (3.886 to 5.105 mm RFT) was well past the region where the augmented bore erosion was postulated to occur.

III. RESULTS AND DISCUSSION

The individual stargauge reports are collected in the Appendix. Table III summarizes vertical land wear at 641.4 mm RFT (25.25 inches).

Table III. Vertical Land Wear at 641.4 mm RFT vs Rounds Fired

Tube Rd No.	Test Rd No.	Diameter Wear, mm	Wear, mm
20	0	0.13	0
120	100	0.20	0.07
320	300	0.46	0.33
380	360	0.58	0.45
540	520	0.86	0.73
620	600	0.84	0.71
720	700	1.02	0.89
820	800	1.04	0.91
920	900	1.17	1.04
1220	1200	1.37	1.24

 $^{^{11}{\}it C}$. Musick, MTD Report in preparation.

Since six hundred HEP rounds should produce only 0.08 mm $(3 \text{ mils})^{12}$ wear, the preponderance of wear in the test is due to the APDS round without the benefit of the insulating residue. Shown in Figure 7 are curves comparing the erosion caused by the APDS round minus the insulating residue, the APDS round with no additive (M392A1), the APDS round with polyurethane foam (M392A2), and the APDS round with TiO2 wax. As predicted from the heat transfer measurements, the round with polyurethane foam still produces more wear than the APDS round with TiO2-wax flaps without insulating residue. A corollary to this observation is that placing flaps on polyurethane foam will decrease erosion, but the polyurethane foam will never provide the protection afforded by repeated firings of rounds with TiO_2 -wax additive.

The downbore wear produced by the 1200 APDS and HEP rounds is illustrated in Figures 8 and 9 along with wear profiles for the APDS round without additive and with the two standard additives. As anticipated, the secondary wear is greater when the insulating residue is removed providing credence to the earlier hypothesis 10 that secondary wear is related to the relative effectiveness of the wear-reducing additive. Again, the secondary wear for the combination APDS-HEP rounds is still less than the secondary wear for the APDS round with polyurethane foam.

Although the wear for the APDS-HEP round is still less than the APDS round with polyurethane foam, the wear for the APDS round inferred from heat transfer \underline{vs} wear in Figure 4 would be 0.9 $\mu\text{m/round}$. On the basis that the wear from the APDS and HEP round can be decoupled, the APDS wear is 1.16 mm in 600 rounds after subtracting the 0.08 mm wear for 600 HEP rounds. This is a wear of 1.9 $\mu\text{m/round}$, considerably higher than the 0.9 $\mu\text{m/round}$ from the heat transfer correlation and well outside the error for the other three points. This can be further illustrated from a semi-log plot of wear vs heat input in Figure 10 where one sees the 1.9 $\mu\text{m/round}$ for the 381 J/mm heat input of the APDS (TiO2-wax) with no insulating residue falls well outside the correlation for the other three points.

An alternate explanation is that the wear for the APDS and HEP rounds cannot be decoupled. Instead, the wear for the 1200 alternating APDS-HEP rounds is more severe than the total expected from 600 HEP and 600 APDS eliminating the insulating residue. Some evidence for such synergism is found in experiments by Niiler and co-workers on the oxygen concentration profile on steel exposed to combustion gases 13,14.

¹² L. R. Neally, "Development and Engineering Tests of Cartridge, 105 mm, M393E1, HEP-T and TP-T", DPS Report No. 463, June 1962.

¹³A. Niiler, J. E. Youngblood, S. E. Caldwell, and T. J. Rock, "An Accelerator Technique for the Study of Ballistic Surfaces", BRL Report No. 1815, August 1975. (AD#A016899)

¹⁴A. Niiler and R. Birkmire, "Composition Changes in Gun Steel Surfaces Due to Erosive Propellant Burn", Proceedings of the Tri-Service Gun Tube Wear and Erosion Symposium, Dover, NJ, March 1977.

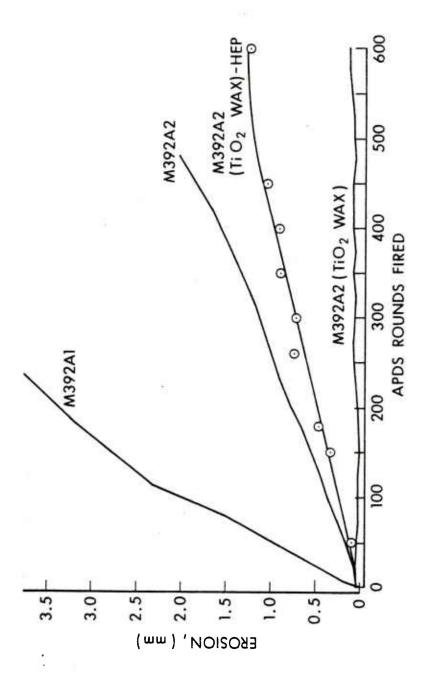
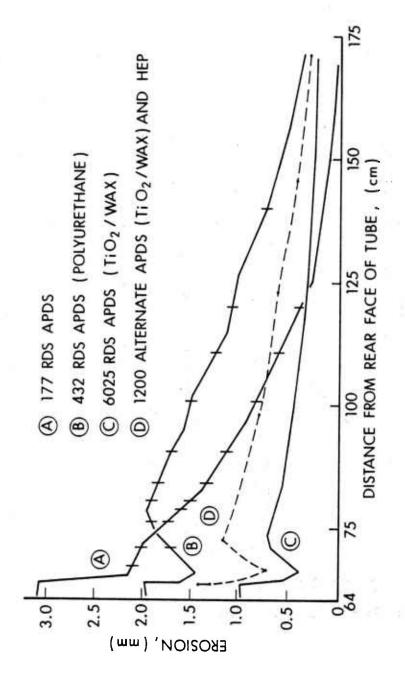
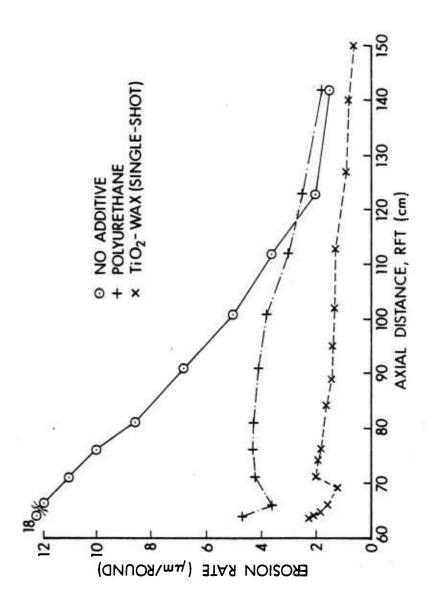


Figure 7. Erosion vs Rounds Fired for APDS Rounds Including APDS-HEP Series



Erosion vs Distance Measured from RFT for APDS Rounds with Additives Figure 8.



Wear Profile for the M68 Tank Cannon for APDS Rounds with Secondary Wear Figure 9.

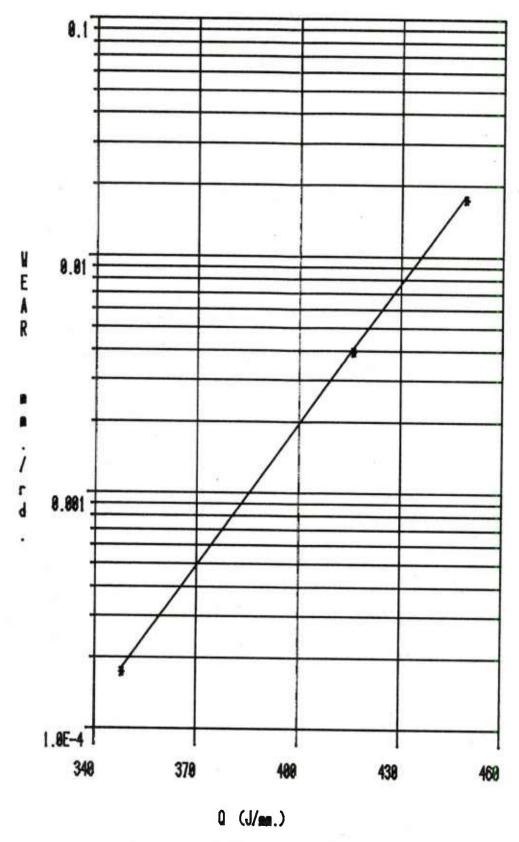


Figure 10. Correlation Between Wear and Heat Input for APDS Rounds with Additives

Table IV summarizes results for propellants with three flame temperatures. One sees the propellant with the higher flame temperature and concomitant higher wear also has the lower oxygen content left on the steel nozzle. This suggests the oxide layer is not as resistant to the hot, flowing gases as steel, since the M2 propellant gases should be as oxidizing as the gases from M1 propellant. Firing a HEP round with M1 propellant may condition the barrel so the next round with M30 propellant will produce more wear than when only rounds with M30 are fired. To demonstrate this conclusively, one need fire rounds without the complication from the insulating residue. Such a combination might be alternate firings of APDS rounds with polyurethane foam and HEP rounds.

Table IV. Oxygen Concentration Profiles on Steel Exposed to Propellants with Different Flame Temperatures

Propellant	Flame Temperature, K	Oxygen, atoms/cm ² , x 10^{-16}
M2	3375	9
M30	2994	17
M1	2480	34

IV. CONCLUSIONS

- 1. The superiority of the ${\rm Ti}\,0_2$ -wax liner ${\rm \underline{vs}}$ the polyurethane liner in the M392A2 APDS projectile arises from the deposition of an insulating residue on the bore surface as well as the presence of flaps on the ${\rm Ti}\,0_2$ -wax liner.
- 2. The heat transferred to the gun barrel can be used to infer the relative efficiency of a wear-reducing additive.
- 3. Secondary wear with the M392A2 projectile increased dramatically when the insulating layer was not allowed to form. This suggests secondary wear arises from the relative efficiency of the wear-reducing additive at the commencement of rifling \underline{vs} downbore protection.
- 4. The wear from an APDS round appears higher if the APDS round is preceded by a HEP round than by another APDS round.

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- 3. S. Y. Ek and D. E. Jacobsen, "Engineering Study of Barrel Wear-Reducing Additives", Wegematic Corporation Report, Part A, May 1962.
- 4. R. Wolff, "Reduction of Gun Erosion Part I. Laminar Coolant", Picatinny Arsenal Technical Report No. 3069, May 1963.
- 5. R. O. Wolff, "Reduction of Gun Erosion Part II. Barrel Wear-Reducing Additive", Picatinny Arsenal Technical Report No. 3096, August 1963.
- 6. T. L. Brosseau and J. R. Ward, "Reduction of Heat Transfer to Gun Barrels by Wear-Reducing Additives", BRL Memorandum Report No. 2464, March 1975. (AD#B003850L)
- 7. F. A. Vassallo, "Heating and Erosion Techniques Applied to the Eight-Inch Howitzer", 12th JANNAF Combustion Meeting, Volume 1, CPIA Publication 273, December 1975.
- 8. T. L. Brosseau and J. R. Ward, "Reduction of Heat Transfer in the 105 mm Tank Gun by Wear-Reducing Additives", BRL Memorandum Report No. 2698, November 1976. (AD#B015308L)
- 9. T. L. Brosseau and J. R. Ward, "Measurement of Heat Input into the 105 mm M68 Tank Cannon Firing Rounds Equipped with Wear-Reducing Additives", BRL Technical Report 2056, April 1978. (AD#A056368)
- 10. J. R. Ward, "Proposed Mechanism for Secondary Wear in the M68 Tank Cannon", BRL Memorandum Report No. 2557, November 1975.(AD#B008040L)
- 11. C. Musick, MTD, report in preparation.
- 12. L. R. Neally, "Development and Engineering Tests of Cartridge, 105 mm, M393E1, HEP-T and TP-T", DPS Report No. 463, June 1962.
- 13. A. Niiler, J. E. Youngblood, S. E. Caldwell, and T. J. Rock, "An Accelerator Technique for the Study of Ballistic Surfaces", BRL Report No. 1815, August 1975. (AD#A016899)
- 14. A. Niiler and R. Birkmire, "Composition Changes in Gun Steel Surfaces Due to Erosive Propellant Burn", Proceedings of the Tri-Service Gun Tube Wear and Erosion Symposium, Dover, NJ, March 1977.

APPENDIX STARGAUGE MEASUREMENTS

ENGINEERING MEASUREMENTS AND ANALYSIS DIVISION PHYSICAL TEST BRANCH REPORT NO. 77-1-63

STEAP-MT	-G				Date of	Test 26	Sep 77
Title M	easurement	s of 105 MM,	M68 Cannon	Tube SN 248	50 (Speci	al)	
TECOM Pro	oject Titl	e Product Im	provement Te	est Cartrid	ge, 105 M	M, M735	
TECOM Pr	oject No.	1-MU-001-735	-008 W	0. No. 4	45-92777-	93 .	
Conducte	d for Mr.	Ruff, Artill	ery Ammo Br				
Referenc	e <u>TM 9-10</u>	00-202-14, MP	750-1				
OBJECT O	F TEST:						

To inspect and identify those conditions which may ballistically effect the cannon tube operation or personnel safety in accordance with TM 9-1000-202-14.

INTRODUCTION:

105 mm M68 cannon tube SN 24850 (Special) after firing 20 rounds was submitted for determination of its physical characteristics.

PROCEDURE:

- Chamber, Bore and Rifling Diametrical Measurements:
- a. The chamber and centering cylinder were diametrically measured using a vernier stargage equipped with a 120° spaced three point measuring head. The gage vernier was adjusted to coincide with a 5.000-inch (127.00 mm) ring gage for the area between .10 inches (2.50 mm) and 18.40 inches (467.36 mm) from rear face of tube (RFT) and a 4.400-inch (111.76 mm) ring gage for the area between 21.85 inches (554.99 mm) and 24.05 inches (610.87 mm) from RFT. The measurements were taken with the points in a 2-6-10 o'clock position and again with the points in a 4-8-12 o'clock position. The vernier stargage measurements added to the respective ring gage diameters were taken to be the actual diameters of the chamber.
- The main bore was diametrically measured using a vernier stargage equipped with a four point head having two measuring points spaced 180° apart. The gage vernier was first adjusted to coincide with a 4.134-inch (105.00 mm) ring gage for measurements across the bore and secondly to coincide with a 4.224-inch (107.29 mm) ring gage for measurements across the rifling between 25.10 inches (637.54 mm) and 210.25 inches (5340.35 mm) from RFT. The measuring points were locked into position, using a guide plate at the muzzle, in such a manner that by following the rifling twist to the commencement of rifling the measuring points were located in a 12-6 o'clock position for the measurements, in turn, across the vertical bore and

rifling. The measuring points were then rotated 90° from the vertical position at the muzzle and by following the same procedure as previously outlined the measuring points were located in a 3-9 o'clock position for the measurements, in turn, across the horizontal bore and rifling. The variations from the basic diameters were shown on the gage vernier in +.001-inch (.0254 mm) increments.

c. The bore diameter was measured in a vertical and horizontal plane at 25.25 inches (641. 35 mm) from RFT using a 105-mm pullover vernier gage having a basic diameter of 4.134 inches (105.00 mm).

2. Detection of Defects:

The complete bore was visually inspected using a white light borescope to observe for heat checking, erosion, scoring, damage, cracks, and/or other defects.

TEST RESULTS:

- 1. Chamber, centering cylinder and main bore .10 inch (2.50 mm) to .210.25 inches (5340.35 mm) from RFT.
- a. The chamber, .10 inch (2.50 mm) to 18.40 inches (467.36 mm) from RFT and centering cylinder 21.85 inches (554.99 mm) to 24.05 inches (610.87 mm) from RFT, measurements are shown in Appendix I.
- b. The main bore measurements 25.10 inches (637.54 mm) to 210.25 inches (5340.35 mm) from RFT are shown in Appendix I.
- 2. Pullover vernier gage measurements 25.25 inches (641. 35 mm) from RFT.
- a. The pullover vernier gage measurement 25.25 inches (641.35 mm) from RFT showed a bore diameter of 4.141 inches (105.18 mm) vertically and 4.140 inches (105.16 mm) horizontally.
- b. The vertical measurement at 25.25 inches (641.35 mm) from RFT as compared to the 105 mm M68 wear pattern chart (life remaining) showed a remaining wear life of 93%.
 - 3. White Light Borescope.

Complete borescope remarks are shown in Appendix I.

CONCLUSIONS:

1. Stargage Measurements:

a. The chamber and centering cylinder measurements showed a normal diameter for a 105 mm M68 cannon tube.

b. The main bore measurements showed a normal wear pattern for a 105 mm M68 cannon tube between 25.10 inches (637.54 mm) and 60 inches (1524 mm) from RFT. The measurements of both the bore and rifling between 60 inches (1524 mm) and the muzzle showed enlargement indicating scoring and abrasive wear.

White Light Borescoping:

The tube contained damages to the rifling between 153 inches (3886.20 mm) and 201 inches (5105.40 mm) from RFT. These damages consist of rifling stripped and flattened. The damages in conjunction with the irregular scoring and abrasive wear would adversely affect the obturation of any type of projectile fired and thus adversely affect the ballistic operation of the tube and the safety of operating personnel. It is therefore declared "Hazardous" and stencilled in accordance with MP 750-1.

1 Incl

Appendix I - Chamber, Bore and Rifling Measurements Data and Borescope Remarks

SUBMITTED:

J. V. MCWILLIAMS, III
Measurements Section

REVIEWED:

K. A. JONES

Chief

Measurements Section

APPROVED:

R. L. HUDDLESTON

Chief

Physical Test Branch

Table 1. 105 MM M68 Cannon Tube SN 24850 (Special) Chamber Diametrical Measurements after 20 Rounds

DISTAN	CE (Inches) FROM/			GAUGE MEAS	UREHENTS I	NDICATED IN	1/1000 OF	AN INCH	
REAR FACE	MUZZLE	REAR FACE	BASIC			mounted.	1		MININGE	7
F BREECH	FACE	OF TUBE	DIAMETER	ZERO	READING	DIAMETER	DIFFERENCE	GAUGE READING	ACTUAL DIAMETER	DIFFERENC
32,05	186.45	24.05	4.416	8	1017	4.417	1001	+017	4.417	+00
31,00	187.50	23.00	4.427	007	30	430		29	429	2
30,00	188.50	22,00	4.437	1	40	440	3	40	440	
29.85	188.65	21.85	4.438		+042		+004		4.441	+00=
26.40	192.10	18.40	4.977		-020	4980	+003	-021	4979	7003
26.00	192.50	18.00	4.985	1	11	989	7	11	989	4
24.00	194.50	16.00	5.025		4028	5.028	3	+027	5.027	-
22.00	196.50	14.00	5.065		68	68	-	67	67	- 67
20.00	198.50	12.00	5.105		101	107	2	107	107	-
18.00	200.50	10.00	5.145		147	140	2	147	147	-
16.00	202.50	8,00	5.185	*	188	188		180	188	
14.00	204.50	6.00	5.225	000	230	230		238	858	
12.00	206.50	4.00	5.265	5.	269	269 308	4	200	260	, =
10.00	208.50	2.00	5.305	-,	308	308	3	35.6	300	=
9.00	209.50	1.00	5.325		328	328		.327	327	22
8.50	210.50	.50	5.335		338	338	3	237	337	2
8.25	210.25	.25	5.340	8 1	342	342	2	342	342	Mark Wall Colonial Co
8.10	210.40	.10	5.343		+345	5.345	1002	+345		400Z

Table 2. 105 MM M68 Cannon Tube SN 24850 (Special) Bore Diametrical Measurements after 20 Rounds

unstance	inches/	From	Dage Heap,	Indicated	HI 1/1000 3	an incl
Rear Face	Muzzle	Rear Face	4.13h"Hasic	Diameter	1.221/1E2110	NES amates
of Breech	Page	of Tube	Vert.	Hor.	Vert.	Hor.
218.25	.25	210.25	+005	+005	+029	+024
217.00	1.50	209.00	+005	+005	51	2
15.00	3.50	207.00	4	===		10
213.00	5.50	205.00	-3	3	23	18
208,00	10.50		-3		23	
203.00	10.50	200,00	3	生	= = = = = = = = = = = = = = = = = = = =	18
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93.00 88.00	25.50	185.00		- 5	-	2
00.00		180.00			20	2
83.00 78.00	35.50	175.00	-3		24	
	40,50	170.00	-	-5	21	2
73.00	_45.50	165.00	-3	5	24	20
68.00	50.50 55.50	160.00	2	5	24	2
63.00	55.50	155.00	1	5	24	20
58.00	60,50	150.00	5	7	25	1
153.00	65.50	145.00	7	3	24	20
U.8.00	70.50	140.00	- 8	— 刊	17	18
43.00	75.50	135.00	0		17	
138.00	80.50	130.00	5	4	18	18
133.00	85.50	125.00	1	4	17	17
128.00	90.50	120.00	1	3	16	13
123.00	95.50	115.00	当	3	155	<u>ا</u> ا
118.00	100.50	110.00	2		14	(
113.00	105.50	105.00	3	3	12	10
108.00	110.50	100.00	3	3	10	C
103.00	115.50	95.00	2	3	10	7
98.00	120.50	90.00	2	3000	9	7
93.00	125.50	85.00	กลลล	2	8	8
88.00	130.50	80.00	2	.3	G	
83.00	135.50	75.00	2	2		-
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73.00	11,5,50	65.00	2	2	Š	C.
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58.00	160.50	50.00	33	2	4	. 4
53.00	165.50	1,5.00		4	3	4
1,8.00	170.50	40.00	4	——————————————————————————————————————	3	4
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37.00	181.50	29.00	4	=======================================	=	-
36.00	182.50	28.00	2	-	6	7
35.00	183.50	27.00	3	21		-
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33.10	185 25 185 10	25.25 25.10	+007	-m	1007	+000

Table 3. 105 MM M68 Cannon Tube 3N 24850 (Special) Borescope Remarks after 20 Rounds

not measured. Borescoped: (Not Chrome Plated) Light scratches, stains, carbon and other deposits thru-out chamber and main bore. Two piezo gage holes drilled in chamber. One at 14.37" from rear face of tube in the 10:00 o'clock area and one at 20.5" from (RFT) in the 2:30 o'clock area. Light erosion and scoring encircling both holes. Two piezo gage holes drilled in bore, One at 28" (NFT) in the 10:00 o'clock area and one at 38" (RFT) in the 2:30 o'clock area. Light heat checking on edges where holes are drilled thru the lands. Light heat checking encircling non-rifled portion of forcing cone and extending forward to 60" from (RFT), Any further heat checking obscured by carbon deposits. Very light erosion encircling forcing cone area. Edges of lands lightly rounded to 75" from (RFT). Moderate erosion and scoring encircling bore evacuator holes. Tube contains damage to 18 lands in the 11:00 o'clock area between 153" and 201" from (RFT). Damages consist of lands being stripped and flattened. Tube co contains moderate scoring and abrasive wear on lands and in the grooves between 60" from (RFT) and the muzzle.

_						1.0	5 ml Tube,	1468					
				Distance	(inches)	From Hain	are - 21.5	li to 210 Indicated NDS C Digmeter Hor	50"				
	- 1	\ /		Rear Face		Dan Z	20 1 0 100 12	INDS		ol sa inc Doves ic Liemete L Hor			
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			30	178.00	35.50	175.00				-			
- 1			70	178.00	40.50	175.00							
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				113.00	100.50	110.00				-			
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- 1			5	68.00	150,50	60,00							
-	-		-	63.00	155.50	55.00							
				58.00	160.50	50.00							
		1	3	53.00	160.50 165.50	45.00							
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STEAP-MT Form 106C, 1 Aug 75 (Replaces STEAP-MT Form 106, 7 Dec 71 which may be used)

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DISTANC	E (Inchee)	FROM			GAUGE MEAS	UREMENTS !	1/1000 OF AN INCH			
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24.00	194,50	16.00	5.025							-
22.00	196.50	12.00	5.065							
18.00	200.50	10.00	5.145						-	
16.00	202,50	8.00	5.185	五	·					
14.00	204.50	6.00	5.225	5.000		·				
12.00	206.50	1.00	5.265	5.						
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STEAP-MT Form 106C, 1 Aug 75 (Replaces STEAP-MT Form 106, 7 Dec 71 which may be used)

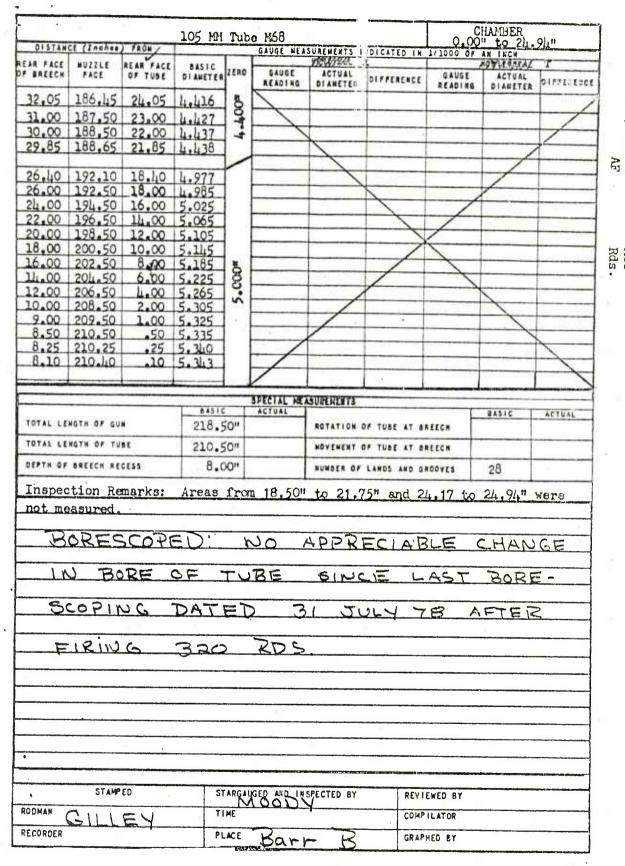
Page 2d2	105 MM Tub	M68			0.00	HAMBER	Ol. H	,
DISTANCE (Inames) FROM			SUREMENTS !	DICATED IN	1/1000 OF	AN INCH	71	W
REAR FACE MUZZLE REAR FAC OF BREECH FACE OF TUBE	BASIC ZERO	SAUGE READING	ACTUAL DIAMETER	DIFFERENCE	GAUGE READING	ACTUAL DIAMETER	OIFFERENCE	77.
32.05 186.45 24.05	4.416 4.427 4.437	4.01	4.417	1,001	t.017	4.417	4001	July 78
31.00 187.50 23.00	4.427	30	.430	3	9.9	'45c		37
30.00 188.50 22.00	4.437	40		3	LIC			00 7
29.85 188.65 21.85	4.438	+.041	4.441	1.003	+041	4.44	4.003	M/M TUBE
26,40 192,10 18.40	4.977	7.020	4.980	F003	1020	4980	+.003	2 1
26.00 192.50 18.00	4.985		989	나		4.980	1	WN
24.00 194.50 16.00		t.028	5.02	3	上の記っ	5.02	्र इ	D 00
22.00 196.50 14.00	5.065	109	390,	ಶಬ್ದಬಹ	67	1901	WOWNE	2584
20.00 198.50 12.00	5.105	194	107	<u> </u>	107	107	3	
18.00 200.50 10.00 16.00 202.50 8.00	5.145	88	.145	3	147	145	3	M68 Rds
14.00 204.50 6.00		230	1230	5	188	135	म	·
12.00 206.50 L.00	5.265	ano	1370	15	269	1269	1	5
10.00 208.50 2.00		309 328	, 309 , 308 , 338	ਮ 3	208	300	2	WTV. ARS
9.00 209.50 1.00	5.325	328	328	3	326	325	300	5
8.50 210.50 .50	5.335	338	.338	# 00 30 30 30	337	337	2	-
8.25 210.25 .25	5.340	342	,342	2	342	340		3
8.10 210.40 .10	5.343	7.53	5,345	4000	+.345	5,345	11003	23
			<u> </u>					
		SPECIAL NE	ASUNEHZITS					
TOTAL LENGTH OF GUN	218.50"	ACTUAL		OF TUBE AT B	-	BASIC	ACTUAL	
								. 7.
TOTAL LENGTH OF TUBE		210.50	HOVENENT	OF TUBE AT B	REECH			NO.
OEPTH OF BREECH RECESS	8.00"		NUNBER OF	LANDS AND G	ROOVES	28	28	200,
Inspection Remarks	Areas fro	n 18.50"	to 21.7	5" and 2	4,17 to	24,94m	were	
not measured.								52
								1, 1
								W>
		7						03.
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	····							26
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								T
4								
			· · · · · · · · · · · · · · · · · · ·					
DATT SI STAMPED	STARGA	UGED_AND_IN	SPECTED BY	REV	IEWED BY			
1101 Stamped	71145	UGED AND I	ISPECTED BY					
1101 Stamped		UGED AND I	SPECTED BY	сон	IEWED BY PILATOR PHEC BY			

7			1	-	THORTON DESCRIPTION
	-		1		. INSPECTION REMARKS
-			MUSICK	_	(PT_IOP: 750_1)
			5	1	Borescoped: (Not Chrome Plated)
			17	00	Light scratches, stains, carbon and other deposits
	اء		18	4	thru-out chamber and main bore. Two riezo gage holes
	2			0	drilled in chumber. One at 14.37" from rear face of tube
님	ARS		mE.	8	(PFT) in the 10:00 o'clock area and one at 20.5" from (PFT)
4			2	U	in the 2:30 o'clock area. Light erosion and scoring
ö	3		10	M	encircling both holes. Two piezo gaze holes drilled in hore. One at 28" from RET) in the 10:00 at look area and
ø	1		C	1	The state of the s
Manufacturer	275		Officer	45	The state of the s
Z,	-			44	to light heat checking, erosion and scoring encircling
			Proof		piezo gage holes in bore, more pronounced on forward edge. Moderate to light heat checking encircling non-rifled
			2	M.0	
+			24	3	46.
					further heat checking obscured by carbon deposits. Mod-
	n.				erate to light erosion with light longitudinal scoring
			_		encircling forcing cone and extending forward to 55" from
	-,		Rounds		(RET). Edges of lands rounded thru-out eroded area with
1			ă		driving edge rounded as far forward as 100" from (RFT).
경	00		5	0	Moderate to heavy erosion and scoring encircling bore
בוחחני	mes		Jo	CK	evacuator holes, more pronounced on forward edges. Tube
	2		1	M	contains damage to 18 lands in the 11:00 o'clock area
			Number	'' /	between 153" and 201" from (RFT). Damages consist of
	.		5		lands being stripped and flattened. Tube contains
1			=		moderate scoring and abrasive wear on lands and in the
			7		grooves between 60" from (RFT) and the muzzle. Light
			one	- 1	coppering in bore between origin of rifling and 45" from (RET).
			1 1		- PRETIA
1			Check	3	No whole and the second
			Chec	3	No photographs or impressions taken at this time.
Tanina.				4	Tube deal and HUAZARDONEH day to design
	0		Sn-	2	Tube declared "HAZARDONS" due to damages in bore. Stencil and handle in accordance with M.P. 750-1.
	10		Status		DUMBLE and manage in accordance with M.P. 750-1.
	09		S a	0	
	ग		fore	5	
	(0)		rir		
			:21	-	
	K		50	1	
	7		in	00	
	F		Gaging	5	
k	OS MM TE		S	3	
X	2		Date of	13	
4	S		Φ	17	
	Ó		at	7	
1	-		ы	1.)	

STEAP-MT Form 181, 7 Dec 71 (REPLACES STEAP-DS FORM 181, 17 JUN 64, WHICH MAY BE USED)

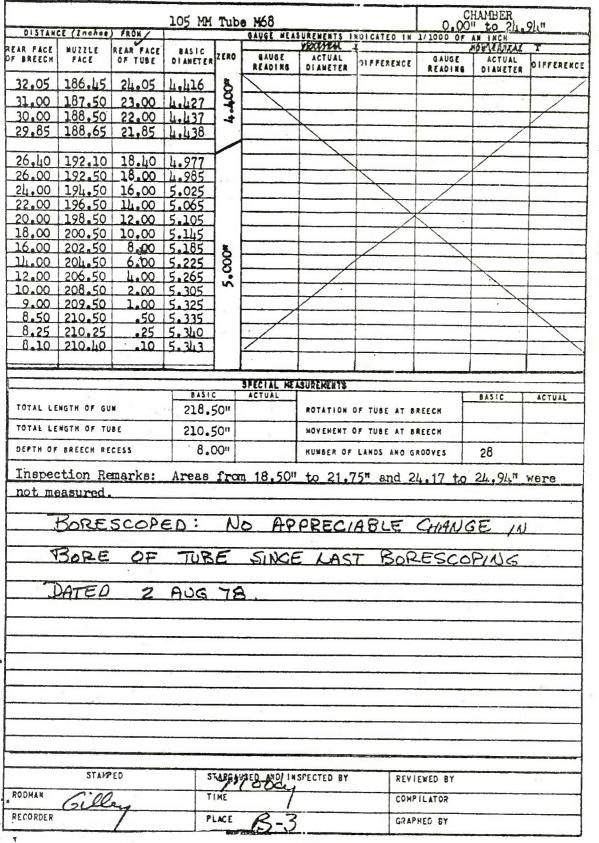
-							05 M Tube	1900			
1				Distance	(Inches)	From Main	Male Head	Indicated	50"	(1) 20	
ox.		V		Rear Face of Breech	Muzzle Face	Rear Face of Tube	4.134"Basi	Indicated NDS Diameter Hor.	Vert	JOVES Hor	
CASTING RUMBER		V		218.25	.25	210.25	A	+	-	-	
3		Y		217.00	1.50	209.00	1	1.	 	-	
¥		٨		215.00	3.50	207.00	1		-	-	
5	1	/\	IN	213.00	5.50	205.00	1	t			
3	- 1	11	.,00	208,00	10.50	200,00		1		1	
		11	PT	203.00	15.50	195,00	1			1	
- 1	-	/ /	52c	198.00	20.50	190.00				1	
			S IL	193.00	25.50	185.00	. \			1/	
4				100.00	30.50	180.00	1			1/	
	in		IL	183.00	35.50	175.00		1		1	
	0		- 0	178.00	40.50	170.00			,	/	
	ARS		SW	173.00	50.50	165.00			1		
MANUFACTURER	1		5.4	168.00 163.00	50.50	160.00			/		
			24)	163.00	55.50	155.00					
	L		4	158.00	60,50	150.00	Brook St.				
3	TVW		PFICE.	153.00	55.50 60.50 65.50 70.50	145.00					
ì	2		F .	1110.00	70.50	140.00	1.4				
	1			143.00	75.50	135.00		1			
			PR00F	138.00 133.00	80.50	130.00					
	1		e -	133.00	85.50	125.00					
-	-			128.00	90.50	120.00		/	\		
				123.00	95.50	115.00	-	/	1		
				113.00	100.50	110.00		-		-	
			1 1	108.00	110.50	105.00	-	/	-	-	
				103.00	115.50	95.00		/		-	
			0	98.00	120.50	90.00		/	1	-	
NO DEL	60		800	93.00	125.50	85.00		/	1	-	
9	¥68		300 C	88.00	130.50	80.00		/	1	-	
	-		131	83.00	130.50	75.00		/		4	
1			NUMBER OF	78.00	140.50	70,00	1			1	
				73.00	1/10.50 1/15.50	65.00	/			1	
			5	68.00	150.50	60.00				1	
+	-	-	-	63.00	155.50	55.00					
				58.00	160.50	50.00				1	
			9	53.00	165.50	45.00	/			1	
	0		6	1,8.00	170.50	40.00	/			1	
	50		(Obest One)	15.25	173.25	37.25	/				
	-			5 5	5 5	43.00 43.25	175.50	35.00	/		
#38MA	00			38.00	177.25 180.50	33.25	+ aut	1010		-	
\$	t			37.00	181 20	30.00	4.014	+.012	7.007	7.00	
	1		BEFORE STATUS	36.00	181.50 182.50	29.00 28.00	13	15	+.007	+.00	
	N			35.00	183,50	27.00	139	18			
			BEFORE	3h.00	184.50	26.00	13	19		- /	
			-	33,50	185.00	25.50	17	13	7000		
				33.25	185-25	25.25	22	20	9	1	
			200	33.10	185.40	25.10	+.027	1.025	4.010	7.01	
	*1.		00	1427-77-17	Value Value		1. 1. 1.		1.010	1.41	
			78								
	_	- 0	223		Pulloyer	Meas.	Vert. "	Hor.	1 1 -1		
	Tube	5	CAUCING CONCINC			25.25"	4.158	4.157	6470	Estimat	
	6	Gan	35					COMPANIES OF STREET	rosaining	course	
	至	至	07	×	-		- "		lifa. *		
	-	-	5	* TU	DE DE	CLARE		PARDOU	2 . DO	E TO	
	105	105	EN	PA	MAGE	IN	BORE	The Marie and Street	A TOTAL PROPERTY.	1	

STEAP-MT Form 106C, 1 Aug 75 (Replaces STEAP-MT Form 106, 7 Dec 71 which may be used)



-	_					1(M Tube,	1968				
	1	1	/ /	Distance	Inches)	From Main	Pere Hean.	Indicated	50"	of an inc		
		\ /		Rear Face of Breech	Muzzle Face	Rear Face of Tube	(18 - 21 0 (1876 Heas) h.13h,"Basi Vert.	Diameter Hor	Vert	of Andrease G Barate Har		
NUMBER	5 1	M				2 2 20 20 20 4			1300	4334.4		
3		V		218.25	.25	210.25	1					
3		Į.		217.00	1.50	209.00	1					
Ē١		Λ	1	215.00	3.50	207.00	 			1		
CASTING	1	11	N	213.00 208.00	5.50	205.00	1		-	/		
4	- 1	11	00	203.00	10.50	195.00	1			-/-		
		۱١		198.00	20.50	190.00	 		-	1-/-		
-			2 6	193.00	25.50	185.00	. \		-	1/		
		-	HUSIER -36852	188.00	30.50	180.00	1		-	1/		
	- 1		20	188.00 183.00 178.00	35.50	175.00	1		-	/		
		- 39	30	178.00	40.50	170.00		1		*		
	w		4.6	173.00	40,50	165.00		1	1	1		
83	N		25	168.00	50.50	160.00	37/50/18	1	1			
HANDFACTURER	ARS		74°	163.00	55.50	155.00	To Daniel St		1			
3			-1	158.00	60.50	150.00			- /			
3	L		50	153.00	65.50	145.00						
#	アンろ		OFFICER	1/18.00	70.50	140.00						
	3		10000000	11,3.00	75.50	135.00						
- 1			FROOF	138.00	80.50	130.00			/	-		
	1		W.O.	133.00	85.50	125.00						
-	-	-	-	128.00	90.50	120.00	-	/	1			
П			3	123.00	95.50	115.00	-		1			
	1		8	113.00	100.50	110.00			1	-		
				108.00	110.50	100.00	7	/	1			
Н	- 1		0	103.00	115.50	95.00		/	-	-		
-7			2	98,00	120.50	90.00		1				
HODE	80		The same	93.00	125.50	85.00		/	1	2010		
₹	86		B) ~	88.00	130.50	80.00			1			
	1		54)	83-00	135.50	75,00		/				
				78.00	11:0.50	70.00	/			1		
1			NUMBER ER	73-00	11,5.50	65.00	/					
			3	68.00	150.50	60.00	-			1		
		_		63.00 58.00	155.50 160.50	55.00 50.00	-			-		
			-	53.00	165.50	45.00	/			-		
- 1					TER	18.00	170.50	10.00	/			1
					2 00	15.25	173.25	37-25	/			1
	0.		WIER	1,3,00	175.50	35,00				1		
CK.	50		Ma	112.25	177.25	33.25	/					
жимеея	00		1 >	38,00	180.50	30.00	+024		+.014	+.014		
×	1		BEFORE TATUS	37.00	181.50	29,00	2.5 2.2	26	14	15		
	7		5 4	36.00	182.50	28.00	22	23	17	15		
	N		BEFORE	35.00	183.50	27.00	11	16	20	18		
1	,		86	3h.00 33.50	185.00	26.00	22	21	13	10		
				33.25	185,25	25.25	29	26 32 + 038	12	15		
		-		33.10	185.10	25,10	+034	+ 038	+:015	+:014		
	8			1154	AV JANY		1.001	. 0.50	1.010			
			00			11						
	100		07.20		Pullover	Meas.	Vert.	Hor.				
	Tube		≅ L			25,25"	4.169	4-167	54%	Estimated		
	4	S.	S.MC						remaining	ACCULACY		
		ĕ	NOG.	-					Lica (W	FART		
	至		3	TUBE	ECLARE	D HAZAK	POUS D	UE TO	VAMAGE	1080		
	105	105	ZATE	TURE	I-OHAI	U HAT	AT 11 10 F	25	0.112			
	and I	-	V15	TADE E	21166116	MI UOL	IT TIME	or one	1100	Electric Notice		

.STEAP-MT Form 106C, 1 Aug 75 (Replaces STEAP-MT Form 106, 7 Dec 71 which may be used)



	To	A.		0/3			5 1M Tuba,			
	, l	d		Distance	inches) h	Main F	Ore - 21.9	اب المفحول حاسيسان والمستنب	0" In 1/1000 () (a) 3 no
-	- 11	. //						V. C34		Ri an inc
	- [\	1	Rear Face	Muzzle	Rear Face	1. 34"Basic		1.221."Fasio	Diarete
ox		M	ŀ	of Breech	Face	of Tube	Vert.	Hor.	Vert.	Hor
ACMOR R		V I	1	218.25	.25	210.25	H.007	+.006	+.030	+,02
2		Y		217.00	1.50	209.00	5	7.006	24	2
٧	- 1	A	ᆏ	215.00	3.50	207.00	5	5	711	1
CASTING		Λ	- 2	213.00	5.50	205.00	1 4	. 5	22 23	1
3	- 1	$I\Lambda I$	00	208,00	10.50	200,00	T L	5	23	
		I/M	51	203.00	15.50	195,00	5	5	22	2
ı		=	2	198.00	20.50	190.00	1	55	24	2
\perp	[10:2	193.00	25.50	185.00	• 5	5	23	- a
			لآمالا	188.00	30.50	180.00	6	5	23	2.
			300	183.00	35.50	175.00	6	9	22	2 2 2 2
			وح	178.00	40.50	170,00	5	8	2	2
	S	Ì	. v	173.00	45.50	165.00	5	P	21	\mathcal{L}
2	M	- 1	الم	168.00	50.50	160.00	5	عا	2.4	2
MANUFACTURER	- 1		me	163.00	55.50	155.00	5	يا ا	23	X
밁			1 1 4	158.00	60.50	150,00	1 9	<u>5</u>	23	
			L ER	153.00	65.50	145.00	1		24	
¥	7		14	118.00	70.50	140.00	1 7	<u> </u>	17	ļ
	I			11,3.00	75.50	135.00	· /	4	17	
1	−₹		FROOF W.O.	138.00	80.50	130.00	<u> </u>	7	1 27	
			2 3	133.00	85 .50	125.00	 			
-	-			128.00	90.50 95.50	120.00	- 1	님	16	
			_	118.00	100.50	110.00	3	1	14	1
1			\bigcirc	113.00	105.50	105.00		3	12	
ı	١			108.00	110.50	100.00	3		C	
	- 1		1, 0	103.00	115,50	95.00	3	3	9	
			~	98,00	120,50	90.00	2	Ц	q	
MODEL	ထ		9	93.00	125.50	85.00	3	3	17	
오	89		ROUNDS	88.00	130.50	80.00	3	3	7	
			70	83-00	135.50	75.00	3			
				78.00	140.50	70.00	3	<u> </u>	وا	
			NUFFE ER	73.00	11,5.50	65.00	1 2	6	5 5	
			2	68.00	150.50	60,00	18	10	5	
-				63.00	155.50	55.00	1 1	12	2	
			17	58.00 53.00	160.50 165.50	50.00	1	वि	3	
			8	1,8.00	170.50	10.00	1 14	55	5	(4
				15.25	173.25	37.25	20	27	10	7
			AFTER	113.00	175.50	35.00	1 21	22		
8			門工	11.25	177.25	33.25	25 25 25 24	23 21 28 29	Q	
HUMBER	0		1 1	38.00	180.50	30.00	1 25	21		
3	6	1	BEFORE STATUS	37.00	181.50 182.50	29.00	25	26	10	
	80		ريا ا ^{ري}	36.00 35.00	182.50	28,00 27,00	57	26	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
			BEFORE	35.00	183,50	27.00	1-1-1	1 1 -	1 1 [-4]	
	J		国路	3h.00	184.50	26.00 25.50 25.25	3	2 [2] 3]	15	
	7		-	33.50	185.00	25.50	+ 37	= 국 :	14	
⊢Ч		-	1	33.25 /	185.25 185.10	25.25	7.040	+. 038		+.0
	٠		00	33.10	102 110	25.10	1.040	7.028	1.013	+.01
			17							
			1		Pullover	Meas	Vert.	Hor.		
	Φ	_	ال ي		· WARDYEL	25.25"	4.169"	Hor.	54%	Estimato
	M Tube	FF Gan	DATE OF CAUGING			-	1-1-1-	11100	54/0 remaining a lite. (W)	rechreck
		9	3 1						lite. (4)	rar
	툿	至	2							
	105	105	140							

STEAP-MT Form 106C, 1 Aug 75 (Replaces STEAP-MT Form 106, 7 Dec 71 which may be used)

Page:	196	3	105 MM	Tub				0.00	HAMBER 11 to 24	9/1"
4	Inches	FROM			GAUGE MEAS	UREMENTS !	DICATED IN	1/1000 OF	AN INCH	
	ACE 737E	REAR FACE OF TUBE	BASIC DIAMETER	ZERO	GAUGE READING	ACTUAL DIAMETER	OIFFERENCE	GAUGE READING	ACTUAL DIAMETER	DIFFERENCE
	6.45	24.05	4.416	400	4:017	4.417	7.001	+.017	4,417	4,001
	7.50 8.50	23.00	4.437	4	<u>30</u> 40	.430	3	29		
	8,65	21.85	4.438	4	+041	.440 4.441	t.003	+.041	4.441	1.003
26.40 19	2.10	18.40	4.977		1020	4.980	7.003	1020	4.980	
26.00 1.9	2.50	18.00	4.985			1,989	Ц	100	989	L
	4.50	16.00	5.025		H.028	5.028	3	十.027		2
	8.50	11.00	5.065		108	300.	3	107	1067	- od
18,00 20	0,50	10.00	5.145		147	,147	2	44	147	3
	2.50	8,00	5.185	Š	188 229	. 188	3	186	.186	
	6.50	6.00	5.225	5.000	270	1370	5	279 279	,239 ,279	4
10.00 20	8.50	2.00	5.305	N	309	1309	니	308	308	3
	9.50	1.00	5.325		328	1398	3	327	765	2
	0.50	.50	5.335 5.340		337	1337	90	337 342	.342	3 3
	0.40	.10	5.313		+.345		1.002	+345	5.345	
							·			
					SPECIAL HE	SUREMENTS				
TOTAL LENGTH	OF GU	12 O	218.5		ACTUAL	ROTATION (F TUBE AT B	SEECH -	BASIC	ACTUAL
TOTAL LENGTH							F TUBE AT B			
			210.5		210.50					
DEFTH OF BRE							LANDS AND G		28	28
Inspection		marks:	Areas	fra	m 18.50"	to 21.7	5" and 2	4.17 to	24,94	Mela
not measi	ured.			 		········				

						******		· · · · · · · · · · · · · · · · · · ·		
-										
										
·										
				-						
	STAMP	'ED ,	S	ARGA	UGED AND IN	SPECTED BY	l BEV	IEWED BY		
1 A TO -		sped		2.1		Cams				
	1	2-1	T	ME			COM	PILATOR		. 1
RECORDER	T	esch		ACE	500			PHED BY		

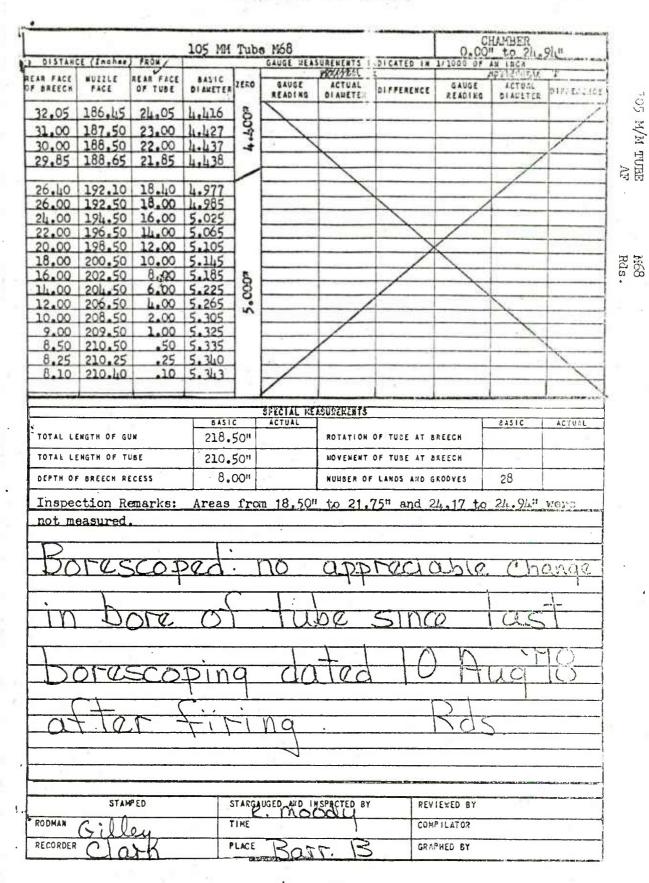
40

	-	- ~	-	20	
1	ı	'	X		INSPECTION REMARKS
	-		7	_	(PT-IOP 750-1)
	-		S	00	BORESCOPED: (Not chrome plated)
- 1			. mus	1	Light scratches, stains, carbon and other deposits
			18	4	throughout chamber and main bore. Two piezo gage holes
	14			b	drilled in chamber. One at 14.37" from rear face of tube
-	الم		O.	$\boldsymbol{\omega}$	(DEG 10:00 o'clock area and one at 20 50 from (DEG
re	ARS		3	36	111 the 4:30 O'Clock area. Light erosion and scoping
밁	٦		L	(7)	Lengireling both holes. Two piezo gage holes drilled in
ac.	~		Ce	, 1	Dore the at 28" from (RFT) in the 2:30 of clock area
Manufacturer	A		Officer	6	Moderate to light heat checking, erosion and scoring
2	2		9	7	enerching piezo gage holes in bore, more pronounced on
2			1	7	forward edge. Moderate to light heat checking encircling
-			Proof	W.0.	non-rifled portion of forcing cone and extending forward
			岀	3	to 80" in the grooves and to 105" on the lands from (RFT).
T					Any further heat checking obscured by carbon deposits.
1					Moderate to light erosion and light longitudinal scoring
		6.13	}		encircling forcing cone with scoring extending forward to
			139		35" and erosion extending forward to 70" from (RFT), Edge
			Rounds		of lands rounded throughout eroded areavith driving edge
-1			Į	0	rounded as far forward as 100" from (RFT). Moderate to
Model	m 6 B	Jo		heavy erosion and scoring encircling hore evacuator holes, more pronounced on forward edges. Appearences of crack	
외	0			(0	patterns in two grooves adjacent to the 9:00 o'clock hole.
			Number	_9	Tube contains damage to 18 lands in the 11:00 o'clock hole.
	کا	٠.	잍		area between 153" and 201" from (RFT). Damages consist of
	_		Ξ		lands being stripped and flattened. Tube contains moderat
+	-				Scoring and abrasive wear on lands and in the grooves
-	1		one	2	between 60" from (RFT) and the muzzle. Light coppering in
			0		bore between origin of rifling and 45" from (RFT).
		11	성		
			(Check	After	No photographs or impressions taken at this time.
Н	- 1		3	YY!	
2			S	2	Tube declared "HAZARDOUS" due to damage in bore.
Number	12	- }	Status		Stencil and handle in accordence with M.P. 750-1.
	4		tal	.	
	5			re	
	7	- 1	Firing	Befo	
	19	-	1	<u>m</u>	
+		-	ഥ		
	00				
	4			5.78	/
	17		пg	T	
	1		Gaging	10	
	2		S	3	
26	Smm		Jo	I	
7	5		0	1	
	0		Date	0	

STEAP-MT Form 181, 7 Dec 71 (REPLACES STEAP-DS FORM 181, 17 JUN 64, WHICH MAY BE USED)

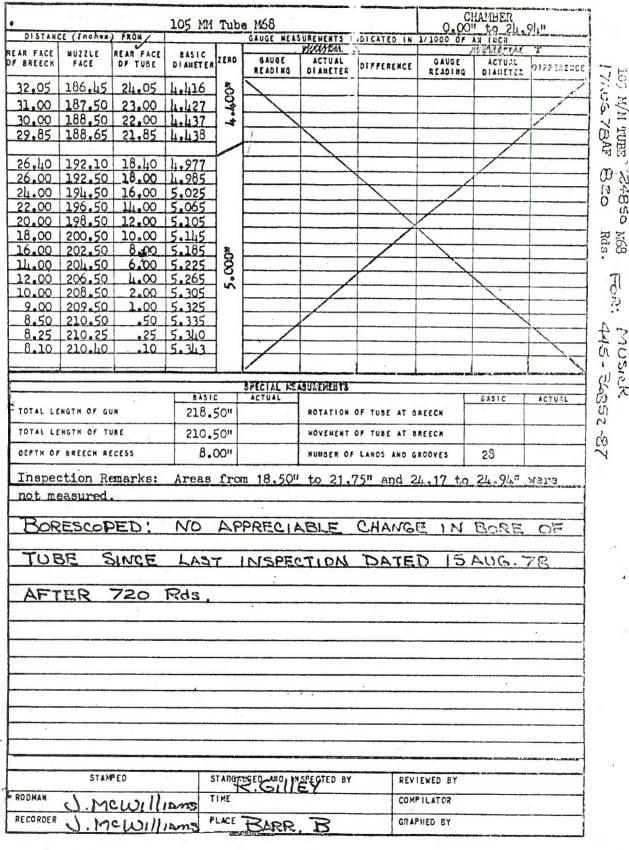
-		_	_			1	05 101 Tube	M68		
		1	1	Distance	(Inches)	From Main	Caro Mean	Indicated	50" M 1/1000	57 an C
*		1		Rear Face of Breech	Muzzle	Rear Face of Tube	4.134"Basi	Indicated ND ic Diameter Hor.	Vert	or Planes
CASTING NUMBER		V		218.25	.25	210,25	1	-	-	
2		Y	10000	217.00	1.50	209.00	1	-	-	-
3		Λ	1	215.00	3,50	207,00	1			/
15		11	à	21.3.00	5.50	205.00				1 /
0		11	2	208.00	10,50	200,00				
		/ \	- CA	203.00	15.50	195.00	1			
			Luca	193.00	25.50	190.00	1	-		/
			200	168.00	30.50	185.00 180.00	1	-	 	1
			80	183.00	35,50	175.00	-	1	 	7
П	5		11/	178.00	40,50	170,00		1	1	-
	w		30	173.00	45.50	165.00			1	-
MANUFACTURER	AR		M	- Child M. R. M. St.	50.50	160.00				
6	1		1	163.00 158.00	55.50	155.00		1	/	
UFA	>		8	153.00	60,50	150.00		1	1_/_	
3	ITV		J.T.	148.00	70.50	11,0.00			1-/	-
	7		22	11,3.00	75.50	135.00		 	1	
	7		50	138.00	80.50	130.00		1	1	-
	1		PR00F	133.00	85.50	125.00		1/	ħ.	
+	-		-	123.00	90.50	120.00		/		
				118.00	95.50	115.00		-	-	
				113.00	105.50	105.00		-	1	
				108.00	110,50	1.00.00		/		1
	- 1		_	103.00	115.50	95.00			1	
=	-		00	98.00	120.50	90.00		/	1	
HODEL	88		72CC	93.00	125.50	85.00		/	1	
	*		X/	83.00	135.50	75.00		/	· ·	-
	- 1		96	78.00	2/10.50	70,00	/			1
	- 1		NUMBER	73.00	145.50	65.00	/			1
			3	68.00	150.50	60.00				
+	-	-	-	63.00	155.50	55.00	-			1
				58.00 53.00	165.50	50.00 45.00	-			-
	1		LATER	1,8,00	170.50	10.00	1			1
			* at	15.25	173,25	37.25				1
			6 5	1,3,00	175.50	35.00				
#GHBER	0		77	13.25	177.25	33.25	-	F 655 6		
15	4850		2	38.00 37.00	180.50 181.50 182.50 183.50	30.00 29.00	+.035 30	7.030 36 37	-t.016	+.01
	00		1	36.00	182.50	28.00	3	- 2 5	18	10
	7		SEE SEE	35.00	183.50	27.00	20	27	173	
		100	BEFORE	3h.00	184.50 185.00	26.00	235	2.6	23	7.
	6			33.50	185.00	25.50	37	33		1
-1	-	-	-	33.25 /	185.25	25.25	1.097	39		1
				11440	103410	25,10	1.047	+.046	7.016	+01
	- 1		an							
		N.	78		Pullover	Меаэ.	Vert.	Hor.		0.07/201
	Tube	5	SAUGING SAUGING			25.25"	4.176"	4.175"	415 10	Estimate
		Gen	37		-	-			resaining	pacuragy
	至	至		Trube	declar	od has	ardou	6 1	lien Cu	(car)
	105	(4) (5)	VS OF	damo	90 Lm	hore	- CACC	s du	2 40	
	0.1	0	5 1	-	1	the second second				-

STEAP-MT Form 106C, 1 Aug 75 (Replaces STEAP-MT Form 106, 7 Dec 71 which may be used)



			_			1	05 141 Tube		-	
П		1	A	Distance	(inches)	From	ROZ - 21	91:" to 210	50"	
		1/		Rear Face of Breech	Muzzle	Rear Face	4. 34"Bas	indicated	Vi.22L"Bas	000 S
NUFFEE		V		218.25			1	1	I.Sta. is a	11327
2		y			.25	210.25	1	-		
		A		217.00	1.50	209.00	1	-		
CASTING	1	1		213.00	3.50 5.50	207.00	-	+.		1
3	1	11		208.00	10.50	200,00	1	-	-	1/
		11		203 00	15.50	195,00	1	-		+-/-
		1	メア	198,00	20.50	190.00	1	+		/
Ц		M. A	36	193.00	25.50	185.00	. 1		1	1/
	-		0.	188.00 188.00 183.00 178.00	30.50	180.00	,	4	1	1/
			2,5	183.00	35,50	175.00		1		/
	10		2%	178.00	40,50	170,00			1	
oc.	ARS			173.00 168.00	45.50	165.00			1	
386	4		35	100.00	50.50	160.00	The second second	1		
5	4		2"	163.00 158.00	55.50 60.50	155.00	-	1	1	
UF	1		310	153.00	65.50	11,5,00		1-1-	1-/-	
MAHUFACTURER	5		24	148.00	70.50	140.00	-	1	1/	-
	5		24	143.00	75.50	135.00	-	1	1	-
	3			138.00	80.50	130.00		1	4	
			PROOF	133.00	85.50	125.00			/\	
-	-		-	128.00	90.50	120.00				1
	1			123.00	95.50	115.00		/		
				118.00	100.50	110.00		-	1	
	- 1		P	108.00	110,50	105.00		/	1	
				103.00	115.50	95.00		/	1	-
	- 1		20	98.00	120.50	90.00		1	1	-
MODEL	00		32C	93.00	125.50	85.00		/	1	
¥	£68		200	88.00	130.50	80.00		/		
			Em.	83.00	135.50	75.00	- /	1		1
	- 1			78.00	140.50	70.00	/			1
	1		#36MU#	73.00 68.00	15.50	65,00	-			
			2	63.00	155.50	55.00	-	-		1
1		-		58.00	160.50	50.00	/	1	 	-
			3	53.00	165.50	15.00	/			1
	- 1		8	18.00	1.70.50	40,00				1
			2 2	115-25	173.25	37.25	/	Land Control		
0*	0		CONSTER ONE)	13.00	175.50	35.00	/			L
NUMBER	850			112.25	1.77.25	33.25	+ 022	1 000		
2	0		E	38.00 37.00	180.50 181.50	29.00 29.00	T. U 37	T.035	+.016	+.010
	24		2	36.00	182.50	28.00	+.033 34 31	+.035 35 30	16	17
	07		SE IRE	35,00	183.50	27.00	31	150	24	2
	. 4		BEFORE	34,00	184.50	26.00	28	26	23	2
	1		-	33,50	185.00	25.50	35	- 34	TE	18
-1	-		1	33-25	185,25	25.25	4-1	4.2	17	1.7
	- 1			33.10	18520	25.10	T.048	+.047	+.017	4016
	- 1		(T)							
	-		78		Pullover	Meas	Vout	Var	-	
	9	-	9 4		- SALVYUI	25.25"	Vert. 4.176"	Hor. 4.175	47594	Estimate
	Tube	Gara	AUG.				1116		remaining	COURSE
		-	57							Very
	35	X	20	Na. 1 10 200	DECL RE.					
	105	105	DATE	1 () 1-2 1	1050	V DEL	HATAGORE	110000	6 10 D	A + 4 5 /7 99

STEAP-MT Form 106C, 1 Aug 75 (Replaces STEAP-MT Form 106, 7 Dec 71 which may be used)



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. 1140 / 4.	PAGE 1 OF.	3
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Т	- 14		T	1		1	05 in Tube			
-		1	A	Distance	inches	From Main	11110 Mana	9 to 210 Indicate	المشاركين بهادرا بطروعها وبروس بمديني	
		1		Rear Face			1 52 425	ANDS		
		1 /		of Breech		Rear Face	4. L311"Bas	ic Diamete	C 1.221"Fas	JOVES 16 In page
tic		11		DA DA BOCK	Face	of Tube	Yarke	ANDS ic Diameter Hor.	Vort.	I Her.
NUMBER R	- 1	W		218.25						
2	. 3	1 ¥			.25	210.25	1.007	t. 006	1+,030	1+.02
		À		217.00	1.50	209,00	5	4	24	3.1
3		1		215.00	3.50	207.00	5	. 5	24	/ /8
CASTING	1	11	1	213.00	5.50	205.00	5	. 5	2.3	1 18
U	1	11		208,00	10,50	200,00	5	5	23	19
	. 4	1		203.00	15.50	195.00	5	5	22	20
-1	1	V 1		198.00	20.50	190.00	6	5	2.4	21
_			12	193.00	25.50	185.00	. 7	5	24	the second second second
				1 - 75	30.50	180.00	6	5	+	2/
-	1		72.8	183.00	35.50	175.00		6	2.3	24
- 1			2 0		40,50	170,00	6	5	2.3	22
			5 10	173.00	15.50	345.00	5	6	21	21
œ			. 00	168.00	45.50	165.00	5	7	21	21
4	3		80		50.50	160.00	5	6	23	20
E	BR.		5 W	163.00	55.50	155,00	5	5	1 23	20
MANUFACTURER	4		~ 1	158.00	60,50	150,00	6	5	23	17
물			2 77 75 75 75 75 75 75 75 75 75 75 75 75	153.00	65.50	145.00	6	4	24-	18
큔	WUT		1	11.8.00	70.50	140.00	6	4	1 17	1 /8
1	3		0.000		75.50	135.00	6	4	1 17	1 13
	2		FROOF	138.00	80.50	130.00	6	4	18	18
	73		FROOF	133.00	85.50	125.00	4	4	17	15
			- 3	1120.00	90.50	120.00	3	4	15	1
				123.00	95.50	115.00	3	4	15	15
1				118.00	100.50	110.00	3	3	1 17	1 10
	= [0	113.00	105.50	105,00	3	3	14	10
			3		110.50	100.00	2	3		10
	1		0	103.00	115.50	95.00		300	10	10
		9		98.00	120.50	50.00	2.	3	9	8
핃	m		SG	93.00		85.00	2	3 3	1 9	8
MODEL	358		Rounds	88.00	125.50	85.00	2	3	8	8
	4			82.00	130.50	80.00	2	.3	1-1	7
			50	83.00 78.00	135.50	75.00	3	5		7
			Œ	72.00	11,0.50	70.00	3	6	3	6
			NIGNS ER	73.00	215.50	65.00	8	7	5"	.5
			3	68.00	150,50	60,00	12	11	5	4
+		-		63.00	155.50	55.00	17	16	5	41
				58.00	160.50	50.00	21	21	5	.5
			AFTER	53.00	165.50	45.00	26	28	6	5
-			6	18.00	170.50	40.00	28	3/	10	11
			AFTER	15.25	173.25	37.25	30	31	16	145
			5 5	43.00	175.50	35.00	31	32	16	1 16
2	0			11.25	177.25	33.25	34	33	13	12
	5		7	38,00	180.50 181.50	30,00	37	33	17	19
2	00		BEFORE C	37.00	181.50	29.00	39	38	17	19
	0.0000		5	36,00	182.50	28,00	40	36	15	£ /
	4		BEFORE	35,00	182.50 183.50	27.00	24	22	30	
	K) 3	5	34,00	184.50	26.00	32	20	23	2.5
			m	33.50	185.00	25.50	32	2.9 38	2.0	2.4
				33.25	185 25	25.25	46		78	19
-		1 1		33.10	185.25 185.40	25 10		4.5		7.017
	5		70000	LIBAV	AV JANV	25,10	+.051	7.049	4.019	7.017
		())	00			-	-			
		3	2		D. 23	Wasan	1100		-	
			8461		Pullover	meas.	Vert.	Hor. 4.180"		
	Tube	Gan	=L			25.25"	4.182"	4.180"	170	Estimate
	6	ő	21 AUGUST /	-			0		remaining	COURTERY
	至	E	0 3	-					Life.	
	2.	X	50	-					-	
				and the same of th						
	105	105	20							

STEAP-MT Form 106C, 1 Aug 75 (Replaces STEAP-MT Form 106, 7 Dec 71 which may be used)

			1.05 1/11	Tub	e M68			0.00	HAMBER " to 21.	oli II
DISTANC	CE (Inches	FROM /				UREMENTS !	CICATED IN	1/1000 01	AN THEN	S. Summerane
AR FACE	MUZZLE	REAR FACE	BASIC			Mary Mary	ζ		KV 1. 1. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4.	1
BREECH	FACE	OF TUBE	DIAHETER	ZERO	READING	ACTUAL DIAMETE:	CIFFERENCE	READING	MUTUAL	SIFYERE:
32.05	186,45	24.05	4.416	20017	+.017	4.417	+.001	+,017	4.417	7.00
31.00	187.50	23.00	heli27	Q	30	. 430	3	.030	.430	
30.00	188,50	22.00	4.437	4	40	.440	3	1040	1440	3
29.85	188,65	21.85	4.1,38		+.041	4.441	1:003	4.041		
-7.1.57	200,07	24107	41130		1.071	7. 771	7003	7.071	4.441	7:003
26,40	192.10	18.40	4.977		020	4.980	t.003	· ,030	4.980	+.00.
26.00	192.50	18,00	4.985		.011	.989	4	.011	.989	7.00
24.00	194.50	16,00	5.025		+,028	5.028	3	+.027	5.027	
22.00	196.50	14.00	5.065		.068	.068	3	.067	.067	
20.00	198.50	12.00	5.105		.107	.107	2	.107		
18.00	200.50	10.00	5.145		.147		2		.107	2
16.00	202.50	8,00		_		147		. 147	.147	2
			5.185	දිරපු	.188	.188	3	. 188	.188	3
11.00	204.50	6.00	5.225	ટ	1229	,229	4	.228	.228	77
12.00	206.50	4.00	5.265	5	.270	.270	5	.269	.269	14
10.00	208.50	2.00	5.305	- •	.309	.309	4	,309	.309	1
9.00	209.50	1.00	5.325	-	.328	. 328	3	.328	.328	3
8.50	210.50	.50	5.335		·338	.338		.338	.338	3
8.25	210.25	.25	5.340		.343	.343	3	,343	.343	3
8.10	210.40	.10	5.343		+.345	5.345	7.002	4.345	5.345	1000
									TAXABLE MALANAMANA	PRINCIPLE CHARLES
			84510		SPECIAL REA	STRINGAUS				
			D 431(MCIUNE I				SALIC	ACTUAL
TOTAL LE	NOTH OF CH	I H	228 (1011						
TOTAL LE	NGTH OF GU	H	218.9	50"		ROTATION	F TUSE AT 8	REECH		
	NGTH OF GU						OF TUBE AT B			
TOTAL LE		381	210,9	50" :	210.50"	HOVENENT C	OF TUBE AT 8	REECH		\
TOTAL LE	NGTH OF TU	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE	NGTH OF TU	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT 8	REECH	23	28
total le oefth of Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE	NGTH OF TU	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
total le oefth of Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
total le oefth of Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
total le oefth of Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,9	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,5	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,5	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,5	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,5	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
TOTAL LE OEFTH OF Inspec	BREECH RE	CESS	210,5	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
total le oefth of Inspec	BREECH RE	CESS	210,5	50" ;	 210.50" 	MUMBER OF	OF TUBE AT B	REECH	23	28
total le oefth of Inspec	BREECH RE	ess marks:	210,9 8.0 Areas	60" :	7/0.50" n 18,50"	HOVEHENT OF TO 21.7	LANOS AND G	REECN PROOVES	23	28
TOTAL LE OEFTH OF Inspec not me	STAME	ess marks:	210,9 8.0 Areas	for fraga	 210.50" 	HOVEHENT OF TO 21.7	LAKOS AHO G	REECH ROOVES	23	28
TOTAL LE OEFTH OF Inspector not me	etion Repasured.	ess marks:	210,9 8.0 Areas	60" :	7/0.50" n 18,50"	HOVEHENT OF TO 21.7	LAKOS AHO G	REECN PROOVES	23	28

	T			
	1		VA	INSPECTION REMARKS
П	- 1		O X	(PT-IOP 750-1)
			music	BORDSCOPED: (Not chrome plated)
	1		3 4	light scratches, stains, carbon and other conceits
	1		2	throughout chamber and main bore. Two piezo a se holes
	vi		(4)	drilled in chamber. One at 14.37" from rear fire of three
1	AR		MR. 366	1 Util in the 10:00 o'clock area and one at 20 50 prove (black)
Manufacturer	4		36	In the 2:30 o'clock area. Light erogion are georgies
다	7		1	encircling rot, holes. Two piezo gage boles deillog in
ac	5		Officer 445-	bore. One at 28" from (RPT) in the 10:00 o'clock are:
Jn	NTU		12 4	and one at 38" from (RFT) in the 2:30 o'clock area.
F	2		19 5	Moderate to light heat checking, erosion and secring
Σ	7		4	encircling viezo gage holes in tore, more pronounces on
			Proof	forward edge. Moderate to light heat checking encircling
	- 0		Proo.	non-rifled portion of forcing cone and extending forward
\top				to 80" in the grooves and to 110" on the lands from (::1).
				an further heat checking obscured by carbon deposits.
				Moderate to light erosion and light longitudinal cooring
			န္	encircling forcing cone with scoring antarding forward to
			Rounds	35" and erosion extending forward to 70" from (MT). Mores
	0		gon ∧	of lands rounded throughout eroded area with driving edge
de	0		1 11	rounded as far forward as 115" from (RFT). Foderete to
Model	9	Number of Re		renew erosion and scoring encircling hore evanuator beles,
	3		er	forward of 6:00 o'clock bore evacuator bole nicked en.
			Q.	scruped between hore evacuator hole and 130% for (F).
	į		T _L	appearances of crack patterns in two prooves adjacent to
+				the 9:00 o'clock hole. Tube contains damage to 18 language
			one)	in the 11:00 o'clock area between 153"and 201" from VFC).
			o	Damages consist of lands being stripped and flattened,
		- 1	× .	Tube contains moderate scoring and abrasive wear on lands.
1		- 1	Check	and in the grooves between 60" from (RFT) and the muzzle.
			5 5	light connering in bore between origin of rifling and
Number	9		-	45"from (RFT).
E	10		13	
Z	0		Status	No photographs or impressions taken at this time,
1	7	1		
	0	1	ing efo	Tube declared "HAMARDOUS" due to damage in bore,
	10		rii Be	Stencil and handle in accordence with M.P750-1
			F.	
	4		¹² €	
	=		of Gaging	
	5		Se Co	
9			7 7	
31	5 m		o L	
1	2		Date of Gaging	
	\Box		a Co	

STEAP-MT Form 181, 7 Dec 71 (REPLACES STEAP-DS FORM 181, 17 JUN 64, WHICH MAY BE USED)

_		_	_				1	05 MM Tube,			
		1			Distance	(inches)		Hore - 24.9	" to 210.	50"	
		1					1	Naka Baab	NDS.	In 1/1000	an inc
- 1		1/			Rear Face of Breect	Muzzle Pace	Rear Face	4.134"Bas1	c Diameter	L.22h"basi	C Diamete
Oc.	- 1	11			MY MY GOOT	race	of Tube	Vert.	Hor.	Vart.	Hor.
HUPIBER		V			218,25	.25	210.25	+.007	TOO. T	+030	+.62
0.00	- 1	Y			217.00	1.50	209.00	to to			
2		٨	١.		215.00	3.50	207.00	1 6	To	23	7
CASTING	- 1	/\	1 !	1	213.00	5.50	205.00	1 10	1. 6		
5		/ \	1	Ø	208.00	10.50	200,00	6	6		
	- 1	11	144-	1,	203.00	15.50	195.00	1	6	23	ż
		1		P	198.00	20.50	190.00	l m	5	24	y provovo
4	_	/ 11	J	n		25.50	185-00	. 8	7	24	6
			3	90	188.00	30.50	180.00	6	7	22	ć
- 1	- 1		1		183.00	35.50	175.00	7	19	23	- G
-1	in		٤	M	178.00	40.50	170,00	L G	7		(808)
	ARS			1	173.00	45.50	165.00	9	7	21	
JR.	1		el E	1	168.00	50.50	160.00	5	4	24	60
MANUFACTURER	7		2		163.00 158.00	55.50	155.00	19	10	23	- 5
5	1		55	3	153.00	65.50	150.00	-	(a		
3	73 J		OFFICER	7	11.8.00	70.50	140.00	10	5000	34	
*	\equiv		#		11,3.00	75.50	135.00	1	5	18	
- 1	.3			0	138.00	80.50	130.00	6	7	18	
	7		PROOF	9	133.00	85.50	125.00	.5.		9	
					128.00	90.50	120.00	2	15/57	112	
Т			Г		123.00	95.50	115.00	4	T	15	
					118.00	100.50	110.00	3		141	
					113.00	105.50	105,00	3	L	13	
-	- 1		1	7	108.00	110.50	100.00	3	384		
1				7	103.00	115.50	95,00	3	3	8	
ᆲ	03827		2(0	98,00	120.50	90.00	3	4	9	
MODEL	88		SQUEEDS!	K	93.00	125.50	85.00	1	<u> </u>	8	
•	x.		\$,	٦	88.00 83.00	130.50	80.00	5	- 5	10	
- 1	- 1		6	٦	78.00	1/10.50	75.00 70.00	1	d	90	
- 1	- 1		5	1	73.00	11,5.50	65.00	15	17	100	
- 1			NUMBER	1	68.00	150.50	60.00	8	15	3	
1				_	63.00	155.50	55.00	22	20		- {
			П	٦	58.00	160.50	50.00	55	20		- 2
-	- 1		3	ı	53,00	165.50	45.00	35	33	Le	7
			to Que	1	1,8.00	170.50	h0.00	34	38	0	
	- 1		4 3	š	45.25	173.25	37.25	38		16	1.5
2	0		6	i	1,3.00	175.50	35.00	38	41	1	
HUMBER .	850		4	₩	112.25	177.25	33.25	38 43	42	18	15
5	N			4	38.00	180.50	30.00	46	39	211	21
			ACCHOS STATUS	ŀ	37.00	181.50 182.50	29.00 28.00	48	42 39 48	20 28 31	2
	7			e f	36.00 35.00	183,50	27.00	49 31 41	44	28	2
	0		BEEDOL	12	34.00	184.50	26.00	31	27	31	2 2 3 2
	10		E .	•	33.50	185.DO	25.50	49	7/	53	27
				1	33.25	185-25	25.25	54	59	20	21
			1	I	33.10	185.25 185.40	25.10	48 54 +061	+.058	28 31 24 22 20 7.020	t.019
		1		ł							
			CAUCING	4		Pullover	Meas.	Vert.	Hor.		-
	Tube	5	36	V	10		25.25"	Vert. 4.184"	4.187"		Estimated
	4	Gan	31	J			2013001301	102211-72	:	remaining a	CUTACY
	8	3	30	VI.				2.		Lisa. (WE)	20

STEAP-MT Form 106C, 1 Aug 75 (Replaces STEAP-MT Form 106, 7 Dec 71 which may be used)

PAGE 2 OF 3.

STANCE (Inches) FROM GAUGE MEASUREMENTS INDICATED IN 1/1000 of AN IBCH APPLICATION APPLICA	8117			105 MM	Tub				0.00	to 2h.	o), n
### SPECIAL MANUFEMENTS #### SPECIAL MANUFEMENTS ###################################	DISTAN	CE (Inches	FROM/			GAUGE MEAS	URENENTS II	IDICATED IN	1/1000 07	AM INCH	-
32.05 186.45 24.05 4.416 31.00 187.50 23.00 4.427 30.00 188.50 22.00 4.437 30.00 188.55 22.00 4.437 30.00 188.65 21.85 4.438 29.85 188.65 21.85 4.438 26.40 192.10 18.40 4.977 26.00 192.50 18.00 4.985 21.00 194.50 16.00 5.025 22.00 196.50 14.00 5.065 22.00 196.50 14.00 5.065 22.00 196.50 14.00 5.065 22.00 196.50 16.00 5.225 18.00 200.50 6.00 5.225 18.00 200.50 6.00 5.225 18.00 200.50 6.00 5.225 18.00 200.50 10.00 5.145	AR FACE			BASIC		******					T
31.00 187.50 23.00 h.h27 30.00 188.50 22.00 h.h27 29.85 188.65 21.85 h.h38 26.40 192.10 18.40 h.985 24.00 194.50 16.00 5.025 22.00 196.50 11.00 5.065 22.00 196.50 10.00 5.165 18.00 202.50 8.00 5.185 18.00 202.50 8.00 5.185 11.00 204.50 6.00 5.225 12.00 206.50 h.00 5.225 10.00 208.50 2.00 5.305 10.00 208.50 2.00 5.305 8.25 210.25 .25 5.300 8.10 210.40 .10 5.343 SFECIAL RESUMENETS SPECIAL RESUMENETS SPECIAL RESUMENETS SPECIAL RESUMENETS SPECIAL RESUMENETS TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS 8.00" NUMBER OF LANDS AND GROOVES 28 32 4.94" NUMBER OF LANDS AND GROOVES 28 32 32 34 34 34 34 34 34 34 34 34 34 34 34 34	BREECH	FACE	OF TUBE	DIAMETER	1			DIFFERENCE			OIFFEREN
31.00 187.50 23.00 h.h27 30.00 188.50 22.00 h.h27 29.85 188.65 21.85 h.h38 26.40 192.10 18.40 h.985 24.00 194.50 16.00 5.025 22.00 196.50 11.00 5.065 22.00 196.50 10.00 5.165 18.00 202.50 8.00 5.185 18.00 202.50 8.00 5.185 11.00 204.50 6.00 5.225 12.00 206.50 h.00 5.225 10.00 208.50 2.00 5.305 10.00 208.50 2.00 5.305 8.25 210.25 .25 5.300 8.10 210.40 .10 5.343 SFECIAL RESUMENETS SPECIAL RESUMENETS SPECIAL RESUMENETS SPECIAL RESUMENETS SPECIAL RESUMENETS TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS 8.00" NUMBER OF LANDS AND GROOVES 28 32 4.94" NUMBER OF LANDS AND GROOVES 28 32 32 34 34 34 34 34 34 34 34 34 34 34 34 34	32,05	186.45	24.05	4.416	8	4.017	4.417	+001	+.017	4.417	+:00
29.85 188.65 21.85 4.138 26.40 192.10 18.40 4.977 26.00 192.50 18.00 4.985 24.00 194.50 16.00 5.025 22.00 196.50 11.00 5.065 20.00 198.50 12.00 5.105 18.00 200.50 10.00 5.115 11.00 204.50 6.00 5.225 12.00 206.50 4.00 5.225 12.00 206.50 4.00 5.225 12.00 206.50 4.00 5.225 12.00 206.50 4.00 5.225 12.00 206.50 5.355 13.00 209.50 1.00 5.325 8.50 210.25 .25 5.340 8.10 210.10 .10 5.313 8.25 210.25 .25 5.340 8.31 210.25 .25 5.340 8.10 210.10 .10 5.313 8.31 210.25 .25 5.340 8.32 210.25 .25 5.340 8.31 210.25 .25 5.340 8.32 210.25 .25 5.340 8.31 210.25 .25 5.340 8.32 210.25 .25 5.340 8.31 210.25 .25 5.340 8.32 210.25 .25 5.340 8.31 210.25 .25 5.340 8.32 210.25 .25	31.00	187.50	23,00	4.427	3	30	4430		30	430	
29.85 188.65 21.85 4.438 26.40 192.10 18.40 4.977 26.40 192.50 18.00 4.985 24.00 194.50 16.00 5.025 22.00 196.50 14.00 5.065 20.00 198.50 12.00 5.105 18.00 200.50 10.00 5.145 16.00 202.50 8.60 5.225 12.00 204.50 6.00 5.225 12.00 206.50 4.00 5.225 12.00 208.50 2.00 5.305 10.00 208.50 2.00 5.305 10.00 208.50 2.00 5.305 10.00 208.50 3.00 5.225 12.00 209.50 1.00 5.325 8.25 210.25 .25 5.340 8.10 210.40 .10 5.343 SPECIAL MEASUREMENTS TOTAL LENGTH OF SUN TOTAL LENGTH OF SUN TOTAL LENGTH OF TUBE DEPTN OF BREECH RECESS 8.00" NUMBER OF LANDS AND GROOVES 28.50" TO 21.75" and 24.94" were					13						
26.40 192.10 18.40 4.977 26.00 192.50 18.00 1.985 24.00 194.50 16.00 5.025 22.00 196.50 14.00 5.065 20.00 198.50 12.00 5.105 18.00 200.50 10.00 5.145 16.00 202.50 8.00 5.185 14.00 204.50 6.00 5.225 12.00 206.50 14.00 5.265 10.00 208.50 2.00 5.305 9.00 209.50 1.00 5.325 8.50 210.50 .50 5.335 8.25 210.25 .25 5.340 8.10 210.40 .10 5.343 SPECIAL REASUREMENTS TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS 8.00" Inspection Remarks: Areas from 18.50" to 21.75" and 24.17 to 24.94" were	29.85				1	1.041	4.441	+.003			
26.00 192.50 18.00 h.985 21.00 194.50 16.00 5.025 22.00 196.50 1h.00 5.065 20.00 198.50 12.00 5.105 18.00 200.50 10.00 5.145 1h.00 204.50 6.00 5.225 12.00 206.50 h.00 5.265 12.00 206.50 h.00 5.265 10.00 208.50 2.00 5.305 9.00 209.50 1.00 5.325 8.50 210.50 .50 5.335 8.25 210.25 .25 5.340 8.10 210.40 .10 5.343 SPECIAL MEASUREMENTS TOTAL LENGTH OF GUN TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS ROO" TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS ROO" TOTAL LENGTH RESERVENCESS ROO" TOTAL LENGTH RESERV	-/ 1-		20.10	1			./^-				
24.00 194.50 16.00 5.025 22.00 196.50 14.00 5.065 20.00 198.50 12.00 5.105 18.00 200.50 10.00 5.145 16.00 202.50 8.00 5.185 14.00 204.50 6.00 5.225 12.00 206.50 4.00 5.265 10.00 208.50 2.00 5.305 9.00 209.50 1.00 5.325 8.25 210.25 .25 5.340 8.10 210.40 .10 5.343 SPECIAL RESUMERRIYS TOTAL LENGTH OF TUBE DEPTH OF BREECH RECESS ROOM Inspection Remarks: Areas from 18.50" to 21.75" and 24.17 to 24.94" were			18.40		1	1001	4.979		-031	4.979	
18.00 200.50 10.00 5.145 16.00 202.50 8.00 5.185 1h.00 20h.50 6.00 5.225 12.00 206.50 h.00 5.265 10.00 208.50 2.00 5.305 9.00 209.50 1.00 5.325 8.50 210.50 50 5.335 8.25 210.25 .25 5.340 8.10 210.40 .10 5.343 SPECIAL REASUREMENTS TOTAL LENGTH OF GUM TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS ROO" TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS ROO" TOTAL LENGTH OF REMARKS: Areas from 18.50" to 21.75" and 24.17 to 24.94, were					1	1000	707	4	1 000	787	- 6
18.00 200.50 10.00 5.145 16.00 202.50 8.00 5.185 1h.00 20h.50 6.00 5.225 12.00 206.50 h.00 5.265 10.00 208.50 2.00 5.305 9.00 209.50 1.00 5.325 8.50 210.50 50 5.335 8.25 210.25 .25 5.340 8.10 210.40 .10 5.343 SPECIAL REASUREMENTS TOTAL LENGTH OF GUM TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS ROO" TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS ROO" TOTAL LENGTH OF REMARKS: Areas from 18.50" to 21.75" and 24.17 to 24.94, were					1	TOWN	2.050		T. Col	Section 2 in case of the last	_ 2
18.00 200.50 10.00 5.145 16.00 202.50 8.00 5.185 1h.00 20h.50 6.00 5.225 12.00 206.50 h.00 5.265 10.00 208.50 2.00 5.305 9.00 209.50 1.00 5.325 8.50 210.50 50 5.335 8.25 210.25 .25 5.340 8.10 210.40 .10 5.343 SPECIAL REASUREMENTS TOTAL LENGTH OF GUM TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS ROO" TOTAL LENGTH OF TUBE 210.50" DEPTH OF BREECH RECESS ROO" TOTAL LENGTH OF REMARKS: Areas from 18.50" to 21.75" and 24.17 to 24.94, were		designation of the latest designation of		5.005	1				67		2
16.00 202.50 8.00 5.185 8 28 188 3 188 188 11.00 201.50 6.00 5.225 8 29 229 4 208 228 12.00 206.50 1.00 5.265 10.00 208.50 2.00 5.305 9.00 209.50 1.00 5.325 8.50 210.50 50 5.335 8.25 210.25 .25 5.310 8.10 210.10 .10 5.313 7.316 5.314 7.316 5.314 7.003 7.315 5.345 7.00 5.315 8.10 210.10 .10 5.313 7.316 5.314 7.316 5.314 7.003 7.315 5.345 7.00 5.315 8.10 210.10 .10 5.313 7.316 5.314 7.003 7.316 5.316 7.316 5.316 7.316 5.316 7.316 5.316 7.316 5.316 7.316 5.316 7.316 5.316 7.316 5.316 7.316 5.316 7.316 5.316 7.316		-			1		107		101		
8.50 210.50 .50 5.335 3.38 3.38 3.38 3.38 3.38 3.38 3.3						177	147	2	147	147	2
8.50 210.50 .50 5.335 3.38 3.38 3.38 3.38 3.38 3.38 3.3	16,00	202.50	8.00	5.185	3	188	188	3	188	188	3
8.50 210.50 .50 5.335 3.38 3.38 3.38 3.38 3.38 3.38 3.3	14.00	204.50	6.00	5.225	ğ	229	229	4	228	228	3
8.50 210.50 .50 5.335 3.38 3.38 3.38 3.38 3.38 3.38 3.3					100	270	270	5	218	269	- 4
8.50 210.50 .50 5.335 3.38 3.38 3.38 3.38 3.38 3.38 3.3		208-50			10	309	309	4			7
8.50 210.50 .50 5.335 3.38 3.38 3.38 3.38 3.38 3.38 3.3					1	750	370	11	300	370	
SPECIAL MASUREMENTS SPECIAL MASUREMENTS TOTAL LENGTH OF GUN TOTAL LENGTH OF TUBE 210.50" DEFTH OF BREECH RECESS 8.00" TOTAL LENGTH ROTATION OF TUBE AT BREECH DEFTH OF BREECH RECESS 8.00" NUMBER OF LANDS AND GROOVES 28 38 Inspection Remarks: Areas from 18.50" to 21.75" and 24.17 to 24.94" were					t	330	330	- 3	220	328	
SPECIAL MASUREMENTS SPECIAL MASUREMENTS TOTAL LENGTH OF GUN TOTAL LENGTH OF TUBE 210.50" DEFTH OF BREECH RECESS 8.00" TOTAL LENGTH ROTATION OF TUBE AT BREECH DEFTH OF BREECH RECESS 8.00" NUMBER OF LANDS AND GROOVES 28 38 Inspection Remarks: Areas from 18.50" to 21.75" and 24.17 to 24.94" were					1	330		3	3773	220	
SPECIAL MEASUREMENTS BASIC ACTUAL TOTAL LENGTH OF GUN 218.50" ROTATION OF TUBE AT BREECH TOTAL LENGTH OF TUBE 210.50" 2/0.50" MOVEMENT OF TUBE AT BREECH DEFTN OF BREECH RECESS 8.00" NUMBER OF LANDS AND GROOVES 28 28 Inspection Remarks: Areas from 18.50" to 21.75" and 24.17 to 24.94" were					1	1273	243		373	542	
SPECIAL MEASUREMENTS BASIC ACTUAL TOTAL LENGTH OF GUN 218.50" ROTATION OF TUBE AT BREECH TOTAL LENGTH OF TUBE 210.50" 2/0.50" MOVEMENT OF TUBE AT BREECH DEFTN OF BREECH RECESS 8.00" NUMBER OF LANDS AND GROOVES 28 28 Inspection Remarks: Areas from 18.50" to 21.75" and 24.17 to 24.94" were	8.10	210.40	-10	5.343	1	7.346	3.346	1:003	+.345	5.345	1:002
	DEPTH O	F BREECH RE	CESS	8.	00"		NUMBER OF	LANDS AND G	ROOVES	28	38
	not m				-	UGED MD IN	SPECTED BY		IEWED BY		
D. Teach TIME COMPILATOR	not m	easured			TARGA IME	OGED MD IN	SPECTED BY				
ECORDER S.C. O.K. PLACE SO GRAPHED BY	not m	Stam Stam		T	IME.	UGED MD IN	SPECTED BY	СОМ	PILATOR		

105 M/M TUBE 24850 M68 For: ME. MCSick 87

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-	1 0	LFIC	3 of 3	, •	
-				INSPECTION REMARKS	
				(PT-IOP 750-1)	
1				PORESCOPED: (Not chrome plated).	
			성	Light scratches, stains, carbon, and other deposits	
1			Musick	throughout chamber and main bore. Two piezo gauge holes	
			疑	drilled through chamber wall, one 14" from rear face of	
24		-	1: ~	tube (RFT) in the 10:00 o'clock area and one 20.5" from	
0			Mr. -87	(RFT) in the 2:30 o'clock area. Light erosion and scoring	
Manufacturer	Ars	17.	22 4	encircling both holes. Two piezo gauge holes drilled thr-	
2	A		68	ough tube wall, one 28" from (RFT) in the 10:00 o'clock	
III.	نب		0fficer 445-36852	area and one 38" from (RFT) in the 2:30 o'clock area.	
9	Wvt		£ 5	Moderate to light heat checking, erosion, and scoring	
				encircling piezo gauge holes in bore, more pronounced on	
			Proof	forward edges. Moderate to light heat checking encircling centering cylinder beginning 23.50" from rear face of tube	
			٦ ع		
				and extending forward into main bore to 80" frem (RFT) in the grooves and to 110" on the lands. Any further heat	
-				checking obscured by carbon deposits. Moderate to light	
1	- 1		TM.	erosion encircling forcing cone and extending forward to	
			Rounds	78" from (RFT). Light longitudinal scoring on lands and	
			Ę	in grooves between forcing cone and 35" from (RFT). Edges	
-			윤	of lands are rounded throughout eroded area with driving	
Mode	8		3 00	edges rounded as far forward as 115" from (RFT). Moderate	
Ě	1	M 68	4	to heavy erosion and scoring encircling bore evacuator	
	Σ			1	holes, more pronounced on forward edges. Driving edge of
1			5	land forward of 6:00 o'clock bore evacuator hole nicked an	
\perp			之	and scraped between bore evacuator hole and 130" from (RFT	
	1		7	Tube contains damage to 18 lands between 153" and 201" fro	
			one	(RFT). Damages consist of lands being stripped and flattened. Tube contains moderate scoring and abrasive wear on	
				ened. Tube contains moderate scoring and abrasive wear on lands and in grooves between 60" from (RFT) and muzzle.	
			Check	Light coppering in bore between origin of rifling and 45"	
			Chec	from (RFT).	
ö			M 5		
Number	2		Status	No photographs or impressions taken at this time.	
2	24850		ल		
	2		လ စ်	Tube declared "HAZARDOUS" due to damage in bore.	
1	- 1		ng S.	Tube declared "UNSERVICEABLE" due to rounds in excess	
1			Firi	of E.F.C. limit of 1000.	
1			迅	Stencil and handle in accordance with M.P.750-1.	
	5-3				
	TUE				
			378		
1	GUN		Date of Gaging 5 December 1978		
	ರ		Ga er		
2	105 M/M		I pe		
2776	ΣÌ		C E		
1	5		Date 5 Dec		

STEAP-MT Form 181, 7 Dec 71 (REPLACES STEAP-DS FORM 181, 17 JUN 64, WHICH MAY BE USED)

No. o	of	No. o	f
Copie	organization	Copie	
2	Commander		
2	Defense Technical Info Center ATTN: DDC-DDA Cameron Station Alexandria, VA 22314	5	Commander US Army Armament Research & Development Command ATTN: FC & SCWSL, D. Gyorog H. Kahn
1	Director of Defense Research & Engineering ATTN: R. Thorkildsen The Pentagon Washington, DC 20301	5	B. Brodman S. Cytron T. Hung Dover, NJ 07801 Commander
1	Defense Advanced Research Projects Agency ATTN: Dir, Materials Div 1400 Wilson Boulevard Arlington, VA 22209		US Army Armament Research & Development Command ATTN: DRDAR-LC, J. Frasier H. Fair J. Lannon A. Moss
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